THE SEAL RIVER

C.H.R.S. BACKGROUND STUDY

Prepared
by
Graham Dodds

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SEAL RIVER CANADIAN HERITAGE RIVERS SYSTEM BACKGROUND STUDY

Executive Summary

Since 1978, Parks Canada has been working with the provinces and territories towards a Canadian Heritage Rivers System (C.H.R.S.). The objectives of this system are to give national recognition to the important rivers of Canada and ensure their future management such that:

a) the natural heritage which they represent is conserved and interpreted;

b) the human heritage which they represent is conserved and interpreted;

c) the opportunities they possess for recreation and heritage appreciation are realized by residents of and visitors to Canada.

Between May 1985 and March 1986, a background study was carried out by Parks Branch, Manitoba Natural Resources, and Parks Canada to determine if the Seal River in northern Manitoba merited designation as a Canadian Heritage River. The study consisted of an inventory of the heritage resources, and an evaluation of these resources against C.H.R.S. selection guidelines. The findings of this study indicate that the Seal River between Shethanei Lake and Hudson Bay meets and surpasses the requirements of a Canadian Heritage River and should, therefore, be nominated for inclusion in the system.

The Seal River is the last great undeveloped river in Manitoba and one of the most remote and wild. It begins its course in subarctic Manitoba at Shethanei Lake, where it flows eastward for 160 kilometers and empties into Hudson Bay. Over its course, the river

flows through a region of transition between the boreal forest to the south and the arctic tundra to the north, known as the northern transitional forest. It is this state of transition between the two life zones, all in a wilderness setting, which gives the Seal River its unique character and appeal.

The Seal River is of special significance for its natural heritage. The processes of prehistoric glaciation have profoundly shaped the environment and created some striking landforms. Huge snake-like eskers intersect the river in several places. The river's erosional force has carved a monolithic bedrock structure which towers 30 meters above the water, diverting the river into two swift-flowing channels. The raw, harsh beauty of this feature creates an unforgettable impression.

Wildlife populations occur in virtually undisturbed populations along the river. Moose, wolves, fox, a multitude of waterfowl and songbirds, and both black bears and polar bears are viewable. Caribou, marten, beaver and muskrat are also found in the area.

Several unique and endangered species of wildlife are found along the Seal River. The river derives its name from a population of harbour seals which range as far upstream as Shethanei Lake or even beyond. Normally marine inhabitants, the seal's adaptation to the freshwater environment is an interesting and little understood departure from their normal habits.

The Seal River estuary is recognized internationally as important habitat for the beluga whale and is possibly the area of highest concentration of this species in the world. The beluga is a highly developed, little understood mammal which converges at the river estuary because of the abundance of food in the marine/freshwater interface. The potential to sight hundreds of whales feeding in the shallow waters of the estuary is a highlight of the

trip and a dramatic end to a journey on the Seal River. The drastic decline in the St. Lawrence River's beluga population in recent years has focussed national attention on this species.

The Seal River is of equal significance for its human heritage. Up to 7,000 years ago, prehistoric bands of nomadic Chipewyan Indians lived and travelled along the Seal. In more recent times, the legendary Samuel Hearne travelled the Seal River and camped at Shethanei Lake during the winter of 1770 as he prepared to enter the uncharted barrenlands in search of potential copper mines.

The natural and human heritage resources of the Seal River provide for an outstanding wilderness canoeing/boating experience. A trip down the river will expose the traveller to the harsh beauty of two distinct life zones. Even the expert canoeist will be challenged by the multitude of hazards such as rapids, submerged boulder fields, ledges and swift-flowing water. Other recreational opportunities such as angling for arctic grayling and lake trout, hiking, photography and nature and human heritage appreciation are unsurpassed. Factors such as remoteness and difficulty of the river, however, tend to limit the river's potential as a high use waterway.

The Seal River can play an integral role in a river system which gives recognition to the important rivers of Canada.

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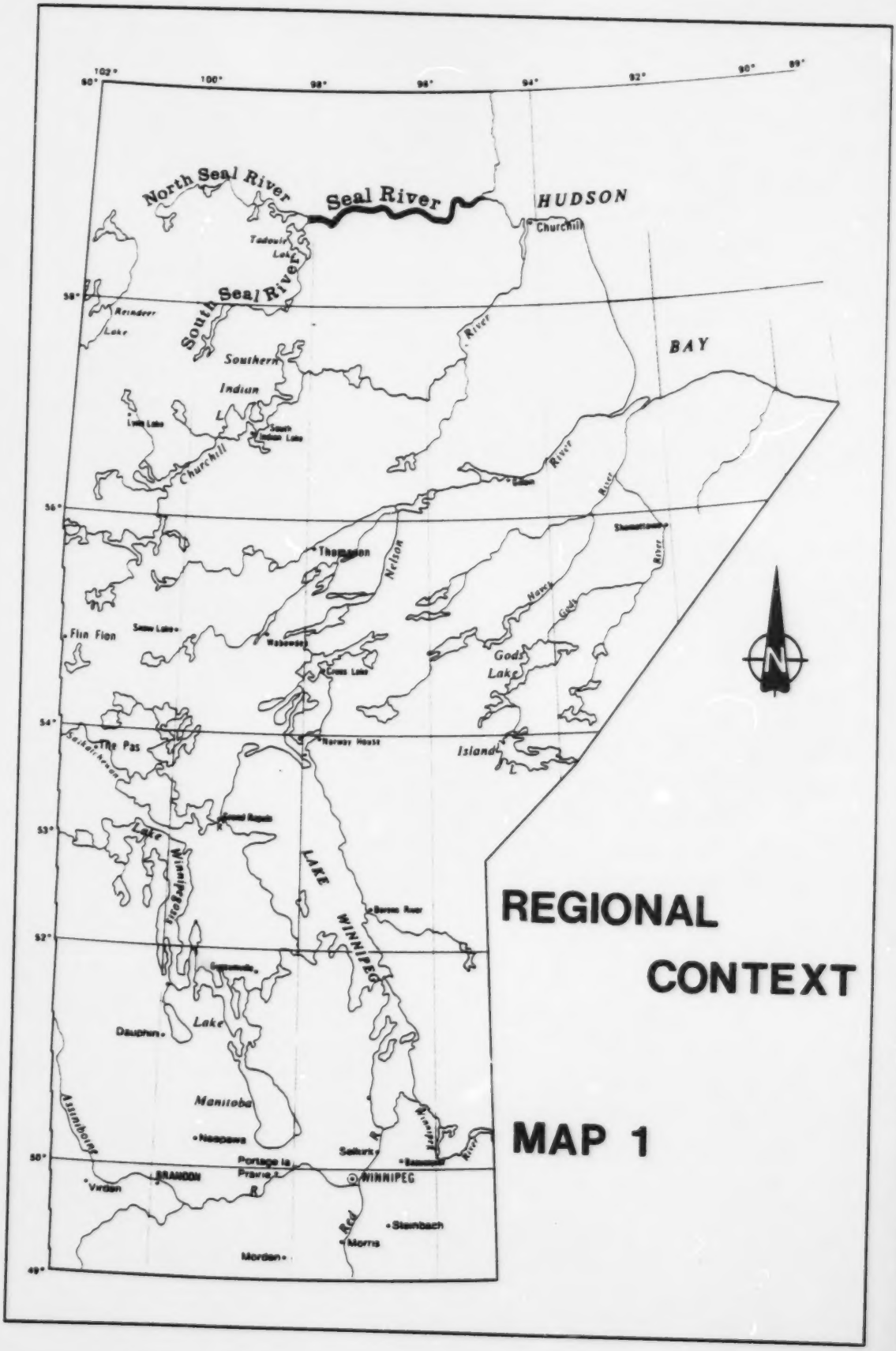
1.0 INTRODUCTION

The Seal River occupies the fourth largest drainage division in Manitoba, and is one of the most remote and wild rivers in the province. It begins its course in northern Manitoba at Shethanei Lake, approximately 1,000 kilometers north of Winnipeg and 230 kilometers west of Churchill (Map 1). From Shethanei Lake, the Seal flows eastward for 160 kilometers through forest and tundra, and empties into Hudson Bay. Because of its remote location and difficulty of access (air and winter road only), the area has received little use and today remains undeveloped.

The region through which the Seal flows is recognized as a state of transition between the boreal forest and the arctic tundra. This region is characterized by a mix of sparse spruce forest and open tundra. It is this state of transition between the two distinct life zones which gives the Seal River its unique character.

Parks Canada (1972) has named the natural region through which the river flows as the Northwestern Boreal Uplands Region, which extends from Hudson Bay in Manitoba into the Northwest Territories. Portions of the Coppermine, Thelon, Kazan and Dubawnt Rivers are found in this region in the Northwest Territories. In Manitoba, the other major rivers in this region are the Thlewiaza and the Caribou, both of which are considerably smaller than the Seal.

There were several reasons for choosing to study the Seal River. The Seal is recognized as the last great wild river in Manitoba. The only comparable rivers, the Nelson and the Churchill, have been developed for production of hydro-electric power. In consequence, they have been permanently altered from their natural state. In 1983 the Manitoba Parks Branch identified the Seal River as a proposed Provincial Recreation Waterway, thus identifying long-range recreational interest in the river. Moreover, the Seal River was


North Seal River
Seal River
HUDSON
Churchill
Tadoule Lake
South Seal River
Reindeer Lake
Southern Indian L.
BAY
Churchill River
Nelson River
Thompson
Flin Flon
Snow Lake
Wabowden
Gods Lake
Gods River
Norway House
The Pas
Island L.
Lake Winnipeg
LAKE WINNIPEG
Dauphin Lake
Manitoba
Neepawa
Portage la Prairie
BRANDON
Virden
WINNIPEG
Selkirk
Steinbach
Morris
Morden
Assiniboine R.
Red R.
N
REGIONAL CONTEXT
MAP 1

selected because its watershed is contained almost completely within the Northwest Boreal Uplands Region, thus its resources were considered to be representative of this region.

The remainder of this section presents the purpose, objectives and methods of the study. This section is followed by a general overview which describes the character of the resources and features of the study area. Section 3.0 provides a detailed description of the river's values. It begins with a discussion of six river segments and 31 individual sites. Segment and site descriptions are based on field inventories and capture the character and quality of the resources and the experience of travel on the Seal. This is followed by further descriptions of major resources, features, processes and occurrences which are important to heritage river evaluation. Section 4.0 addresses specific C.H.R.S. guidelines to evaluate and assess the river's values. Conclusions and recommendations are developed in the final section of this study.

1.1 Purpose of the Study

The Seal River was identified by the Parks Branch, Province of Manitoba, as a priority candidate river for inclusion in the C.H.R.S. This background study was carried out to determine if the river meets the requirements for nomination as a Canadian Heritage River. The Terms of Reference for this study, therefore, state:

> "The purpose of this study is to make a full assessment of the Seal River between Shethanei Lake and Hudson Bay to determine whether or not it merits nomination into the Canadian Heritage Rivers System."

1.2 Objectives

In order to meet this stated goal, the objectives of the study were defined as follows:

To identify and describe the natural, human and recreational resources of the river.

To evaluate and assess these resources against C.H.R.S. guidelines and criteria to determine their significance in the C.H.R.S.

To assess the integrity of the river with reference to C.H.R.S. guidelines for nomination and determine its suitability to be managed as a Canadian Heritage River.

To develop recommendations respecting nomination of the river, further research requirements and interim management measures.

1.3 Methods

This study was conducted in three phases. Phase one consisted of a preliminary analysis of the river's resources within a defined study area. A field inventory to identify and evaluate resources was completed in phase two. The final phase of evaluation and assessment of heritage resources draws together the findings of the first two phases and evaluates them against C.H.R.S. guidelines. A detailed description of the methodology follows below.

Phase One: Preliminary Analysis

The study area was delineated and a literature review completed on information pertaining to the Seal River area. Potential heritage resource sites for field evaluation were chosen on the basis of existing background information and through interpretation of black and white aerial photographs. Potential natural heritage resource sites included geological/geomorphological features such as eskers, bedrock exposures and beaches, distinct plant communities and wildlife habitats. Areas considered likely to have attracted human activity, such as beaches, eskers and caribou crossing points, were identified

as potential human heritage resource sites. Recreational resources usually coincided with natural heritage resource sites since most recreational activities are based on the natural wilderness theme. A field evaluation form was prepared to guide field activities.

Phase Two: Field Investigation

The inventory of identified sites was completed in this phase. Because there was little existing information on the area, the inventory yielded crucial data on the river's resource values. The field inventory took place from July 5, 1985 to July 26, 1985. The study team consisted of a park planner, a resource consultant, and the author. The river was travelled from Shethanei Lake to Hudson Bay in a 16 foot zodiac inflatable rubber boat, powered by a 35 horsepower engine.

Field evaluation forms were completed for each site (Appendix 1). Information recorded on the forms included:

- The age, type, quantity, location and size of potential heritage resources grouped under the following themes:

  Flora
  Fauna
  Geology/Geomorphology
  Human Resources
  Aesthetics
  Capability for Recreation

- A value was determined for each theme on a score of 1 to 5 (1 = poor, 2 = fair, 3 = good, 4 = excellent and 5 = outstanding), based on the C.H.R.S. criteria of significance, uniqueness, naturalness, water quality, harmony, rarity, antiquity and condition, where applicable.

- A cross sectional diagram of the site.

- General comments.

Rapids were evaluated according to the International Whitewater Rating System and scored appropriately.

Photographic documentation occurred throughout this phase.

Phase Three: Identification, Description and Assessment of Heritage Resources

Heritage resources were described and evaluated in this phase. The river was first divided into six segments based on the distinctiveness of various reaches. Segments were selected on the basis of groupings of similar characteristics such as river morphology, flora, fauna, human resources, relief and geology/geomorphology. River sites identified earlier were further evaluated, and deletions and additions made to incorporate information which was not apparent during preliminary evaluation.

The next steps of this phase were an evaluation and assessment of the heritage resources against C.H.R.S. guidelines, determination of the river's suitability for nomination, based on its integrity and management suitability, and the development of final recommendations. Management issues and requirements for further research were also identified.

The raster scan satellite imagery maps which appear in this document present the ecological land classification, as well as information on the segments, site features and rapids (Maps 3 and 4). The Dipix computer color coding scheme was used on both of these maps.

Several comments on the methodology and the conduct of the study are provided below. Particular attention is given to the field investigation phase, and the use of computer maps, which provide specific advantages worth noting.

Because little pertinent information exists on the Seal River or the northern transitional forest as a whole, the field investigation phase was a critical stage of this study. The use of field forms was extremely useful, not only for reference during the evaluation and assessment phase, but especially in the field where feature significance must be determined in both a relative and objective sense, over changing landscapes and life zones. Preliminary air photograph analysis was moderately successful in identifying sites which were selected for inventory.

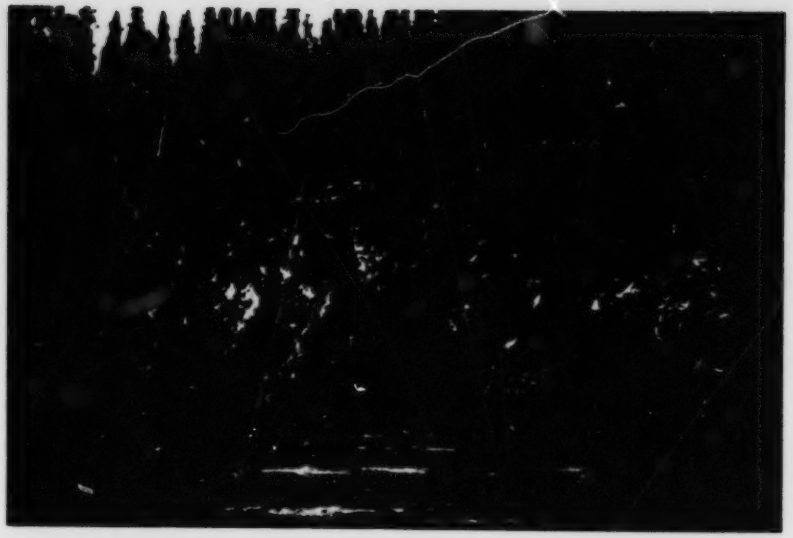
The use of a powered rubber raft allowed more time for field inventory and reduced the dangers associated with canoe travel. The wilderness experience would be totally different if canoes were used, and much of the experience with the land and the river was lost. The findings of this study, therefore, may not quite reflect the excitement and dangers associated with canoeing/kayaking as opposed to rafting.

The use of computer-printed satellite imagery maps provided a useful method of storing and presenting resource information. Dipix image maps have the added benefit of having the ability to have information added or deleted. For future management plans, for example, further information can be automatically or manually added or deleted and correlated with existing data. The Dipix system is, therefore, extremely useful as a dynamic tool for future management. The system is presently being refined and is expected to have an even greater importance in the future.

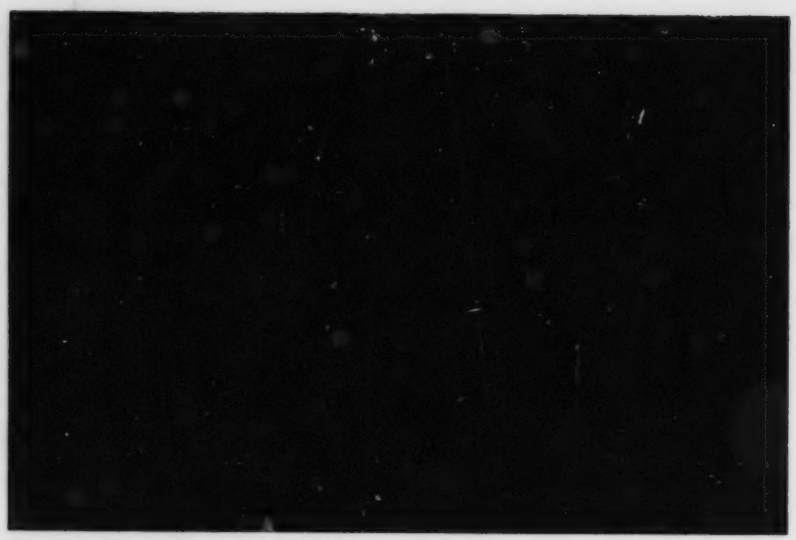
In sum, the methods and approach used in the study were considered appropriate to achieve the study's objectives.

Section 2.0 presents an overview of the character and features of the study area.

1. Rubber Rafting near Shethanei Lake (Segment 1)



2. Great Island Gorge (Site 15)



3. Esker (Site 8)

4. Rapids (Segment 4)

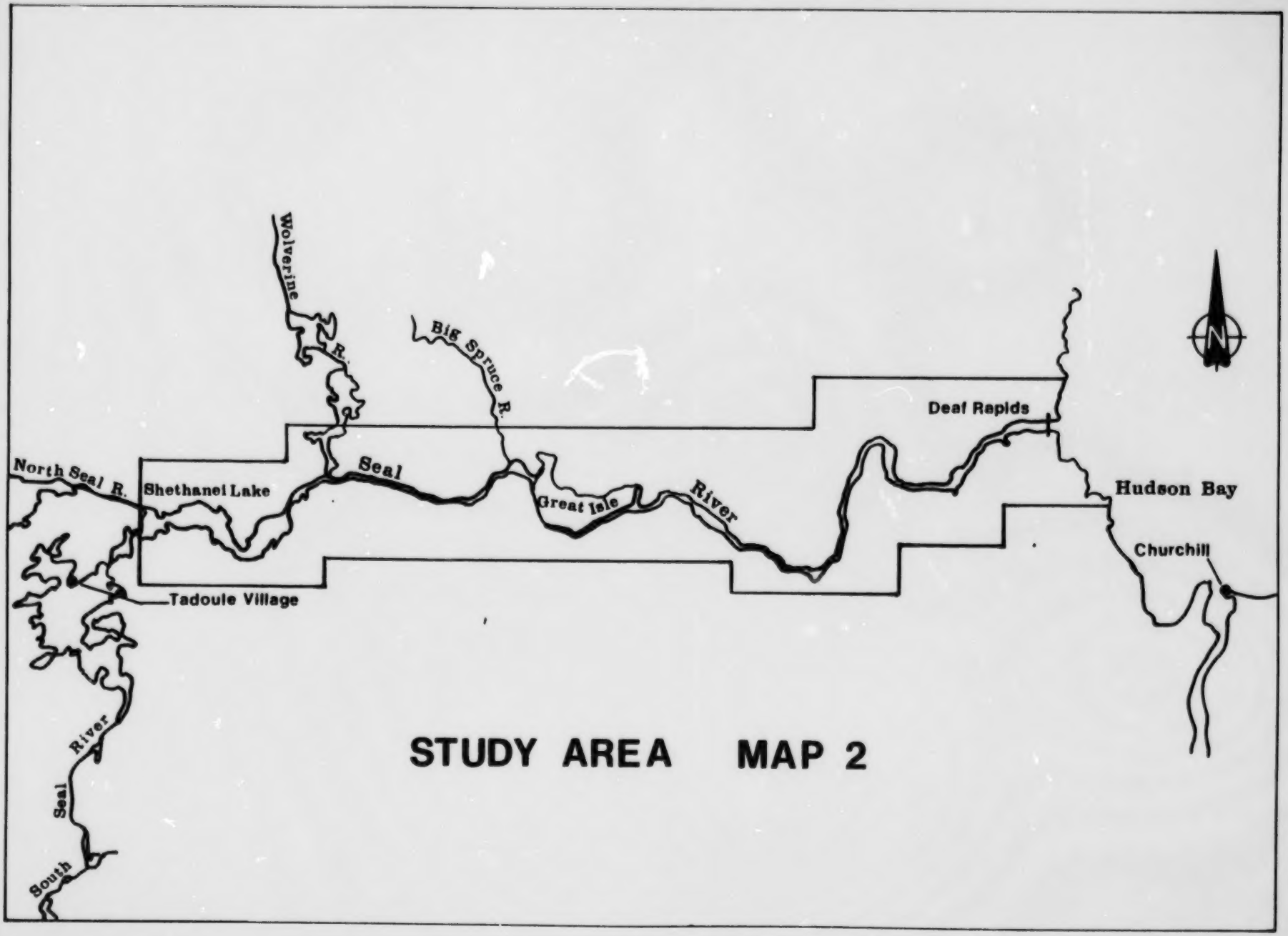
2.0 GENERAL OVERVIEW OF THE STUDY AREA

The purpose of this section is to provide a general understanding and appreciation of the processes, features and values which are elaborated on later in Section 3.0, during the assessment phase of this study.

The study area (Map 2) consists of the complete length of the Seal River, from the west end of Shethanei Lake up to, and including, the estuary at Hudson Bay. The corridor width varies from 20 to 50 kilometers wide, and coincides with Universal Transverse Mercator grids.

The Seal River flows through an ecological region of transition between the high boreal forest to the south and the low subarctic tundra to the north (Map 3). This region, known as the northern transitional forest, is characterized by vegetation of both the forest and the tundra heath environments. Climatic conditions, mainly temperature and hours of sunlight, have been the major influencing factors restricting the advance of forest cover. Prehistoric glaciation, as well as lacustrine and marine action, have played major roles in shaping the transitional forest environment. The region is composed of countless morainal and thermokarst lakes and ponds created by poor drainage and discontinuous permafrost. The topography ranges from flat, organic lowlands to rolling hills or glacial uplands.

Short growing seasons, infertile soils and stony terrain have limited the productivity of the area. As a result, there has been little human activity in the history of the transitional forest, except for the nomadic subsistence of the Chipewyan for several thousand years. Even today, most of the Seal River remains unchanged and undeveloped. Isolation, remoteness and the harsh environment have all acted to preserve the Seal River area in a true wilderness state. For these reasons, relatively little is known or understood about the northern transition forest. Information on the Seal River and the



STUDY AREA MAP 2

surrounding area is sketchy and has been obtained mostly from incomplete reconnaisance level geological and botanical investigations and inventories. The resources of the Seal River are examined under the following headings of Natural Resources, Human Resources and Recreational Resources.

2.1 Natural Resources

Climate

The mean annual temperature is about -7.4°C with extremes of -51°C in winter and 32°C in summer. In January the mean daily temperature is -29.4°C and the mean July daily temperature is 11.6°C. The mean annual total precipitation over the Seal River basin is about 360 mm. with the mean annual total rainfall being about 220 mm. Approximately two-thirds of the total precipitation occurs in the months of May to November, with the highest precipitation generally recorded in June, July and September. Further downstream, the influence of Hudson Bay is felt through colder weather, drizzle and fog. The prevailing winds from the northwest increase in intensity closer to Hudson Bay. Even in mid-summer, the river traveller must be prepared to face a wide range of weather conditions.

Geology/Geomorphology

The Seal River flows through two major Canadian physiographic regions, the Precambrian Shield and the Hudson Bay Lowlands. The area is underlain by rocks of Precambrian age, as is all of Manitoba. Low, broad hills and drumlinoid ridges of till with intervening fens, bogs and lakes are the most prominent regional features.

The Precambrian rock consists mainly of massive granites and gneisses and discontinuous belts of sedimentary rocks, with some small amounts of volcanic rock. In the upper reaches of the river between Shethanei Lake and Great Island, rocks of two distinct ages are

present. The older rocks consist of quartz-rich sediments while the younger rocks, found around Great Island, consist solely of sedimentary rocks. These rocks are mainly quartz-rich but deposits of shale and carbonate, forming a gorge along the south channel of Great Island are highly visible (Davies et al., 1962).

The predominant sediment of the older series of rocks are grey to dark grey impure quartzite with some greywhacke, sandstone, conglomerate, siltstone, argillite and arkose. The younger rocks are diabase dykes and amphibolite, all occurring in the Great Island group. A greenstone belt occurs near the mouth of the river at Hudson Bay (Davies et al., 1962).

Very little is known about the structure of the area, although it is known to be quite complex. The main trend of the rocks is eastward. Tight folding has occurred throughout much of the area and it is most noticeable in the Great Island area, where three steeply plunging synclines are visible. The west part of Shethanei Lake probably occupies a syncline (Davies et al., 1962).

Surface features are mostly composed of glacial drift (moraine) which was deposited during the Pleistocene glacial age. Several striking depositional features associated with glaciation are found throughout the area, mostly composed of sand and gravel. Numerous eskers traverse the area, as they do much of northern Manitoba. Eskers are long ridges of sand and gravel of up to 75 meters high and hundreds of kilometers in length, deposited by the action of the runoff water from receding glaciers. Drumlins, which are linear hills, shaped like inverted spoons, with long axes parallel to the direction of glacial ice movement, alluvial deltaic deposits and beaches are also prominent glacially deposited features in the area. Huge exposed boulder fields, known as felsenmeer, are located along the river's course. Felsenmeer are glacially deposited and frost-shattered areas of rock and boulders piled in trains or fields,

creating a bleak moonscape effect. Where felsenmeer extend into the river, treacherous boulder rapids often stretch uninterrupted for considerable distances.

In addition to these formations, several other features occur in the area which are not of glacial origin. There is evidence that the Seal River follows a pre-glacial channel in places. Fifteen kilometers west of the Great Island the river flows through a deep gorge of gneissic granite 10 to 15 meters high. This channel could not have been cut in post-glacial times (Davies et al., 1962). A conglomerate deposit of interglacial age overlain by till north of Great Island, is another feature of interest, and near Hudson Bay, several marine beach ridges are apparent. These ridges were formed when the pre- historic forerunner of Hudson Bay, known as the Tyrrell Sea, reached a much higher level than present because of crustal depression caused by the mass of glacial ice centered east and northwest of Hudson Bay. As the Tyrrell Sea receded, several prominent beach ridges were formed, and they remain today. The Tyrrell Sea extended to a point about 15 kilometers east of Great Island where marine sediments are first evident.

A delta has begun to form in the lower reaches of the Seal. This delta is in an immature phase, and only a few islands have formed. The river's estuary consists of an intricate network of bedrock, boulders, ledges and rapids, with several poorly-defined channels. Tidal flats are visible for as far as the eye can see at low tide.

Vegetation has had a direct influence on the landforms of the area. Deteriorating permafrost has created the arctic phenomenon known as peat polygons. Peat polygons form when permafrost collapse creates local drainage patterns which favour certain types of lichen and moss growth. Peat formation has also created plateaus of treeless heaths, and covers much of the area closer to Hudson Bay where the climate restricts tree and shrub growth.

The various geomorphic and physical features of the study area are identified on Map 3, and are classified using the Canada Land Inventory System. The key to Map 3 lists seven major features. As shown on the map, the influence of glaciation on landforms is most evident in the western half of the study area; and in the east, the influence of marine inundation is predominant.

Hydrology

The Seal River principal drainage division occupies a total of 44,300 square kilometers of northern Manitoba. A minor segment of 2,185 square kilometers drains from the Northwest Territories. Three major drainage divisions are contained within the Seal River watershed. The South Seal River occupies 15,659 square kilometers, the North Seal River occupies 17,845 square kilometers and the main Seal River drainage division occupies 12,981 square kilometers (Fedoruk, 1970). An automatic monitoring station just east of Great Island has been maintained by Environment Canada, Water Resources Branch, for several years. Records show that floods arrive soon after break-up, peak in June and recede rapidly. Between Shethanei Lake and Hudson Bay, a distance of 160 kilometers, the river descends approximately 252 meters.

Studies done by Manitoba Hydro and consulting firms have identified at least nine sites on the Seal River which are suitable for dam construction (Diakiw, 1955). The possibility of diverting the Seal River south into the Nelson River was also examined (Manitoba Hydro, 1967). It was concluded that diversion was not economically viable in light of several other options for hydro development in Manitoba. The possibility for diversion in the future, however, was not ruled out, depending on future demand and other developments. This would appear to be a long-term consideration since there are several sites which would be developed first on the Nelson River.

ECOLOGICAL LAND CLASSIFICATION MAP 8

KEY TO MAP 3
ECOLOGICAL LAND CLASSIFICATION FEATURES

M - Moraine	H - Hummocky
	M - Rolling
	U - Undulating
	D - Drumlinized
	F - Felsenmeer
L - Lucustrine	U - Undulating
G - Glaciofluvial	R - Ridges
A - Alluvial	D - Delta
	T - Terrace
W - Marine	F - Flats
B - Bog	V - Veneer
	T - Plateau
P - Peat	P - Polygon
	V - Veneer
	Y - Plateau

Flora

Because the Seal River area is a region of transition, there has been no widely used or accepted vegetation zone classification. Several zone names have been given to the region including "open boreal", "taiga", as well as numerous modifications of the term "northern transitional forest".

Excluding the last few kilometers of the river where tundra-form plant species occur, vegetation consists mostly of stunted trees interspersed with openings in lowland and upland areas. These openings are usually covered by thick mats of caribou lichen or reindeer moss, with scattered shrubs and herbs. Black spruce, tamarack and willow are common in the lower, wetter areas, while white spruce and birch are found in the higher, well-drained areas such as eskers.

Ritchie (1956) has identified four subcategories of the transitional forest through which the river flows. They include:

a) Forest Tundra: scrubby black spruce, birch and willow scrub and sedge grass. The vegetation has been man modified. Forest fires and wood cutting have permanently removed many trees from upland sites, leaving a treeless heath.

b) Open Coniferous Forest: the main feature of this zone is the prevalence on upland sites of stands of well-spaced conifers with a ground vegetation consisting of two components — a mat of lichens closely associated with low prostrate shrubs and a discontinuous stratum of medium shrubs. Black spruce are found on poorly-drained areas and white spruce are found on upland sites.

c) Transitional: forms the boundary between the Canadian Shield and the Hudson Bay Lowland. This zone is transitional both in terms of vegetation and physiography. Consists of extensive peats without trees. The occasional upland features such as drumlins or beach ridges are occupied by either open spruce lichen forests or closed spruce feather moss forests.

d) Lowland Complex: poorly-drained bogs with muskegs and stunted trees.

Some of these vegetation sub-categories are noted on Map 3.

Fauna

Fauna in the Seal River area belong to the Hudsonian faunal zone, based on the Merriam system of faunal classification. While the Merriam system has been largely replaced by classification by biomes, the Hudsonian classification for Seal River fauna is worthy of note for two reasons. First, classification by biome does not accurately classify the transition zone between boreal forest and tundra. Secondly, it is interesting to note that the Hudsonian zone contains the lowest number of truly characteristic species in Manitoba. This is because the harsh environment cannot support high populations of wildlife during the winter season. Consequently, many of the species found in the study area are migratory.

An extremely high concentration of beluga whales occurs at the outlet of the Seal River at Hudson Bay. It has been estimated that as many as 3,000 or more belugas use the estuary as calving and feeding grounds, mainly because of the abundance of food associated with the intermixing of fresh and saltwater.

There is presently a research station near the mouth of the Seal River which is the base for investigating means of tagging belugas. Monitoring population movements throughout the north is seen

as the first step in solving some of the mysteries of the whale. A recent drastic and serious decline in the beluga population in the St. Lawrence River has focussed attention on the northern populations of this species.

Another marine mammal, the harbour seal, occurs as far upstream on the river as Shethanei Lake, 200 kilometers inland from Hudson Bay. The Seal River derives its name from this marine mammal, which is usually associated with saltwater rather than freshwater. Their occurrence inland in the river may be an attempt to utilize the concentration of freshwater fish for food and to avoid predators. Foraging seals are a common sight along most of the river.

Polar bears often range as far north as the estuary and beyond, although most of their activity occurs further south towards Cape Churchill. More than 50 bear sightings have been recorded near the estuary by mid-summer in some years. The presence of seals, their primary food, as well as the variety and abundance of other flora and fauna associated with the marine/freshwater interface, are factors in the concentration of polar bears around the estuary.

The Seal River is located within the perimeter of the winter range of barren-ground caribou. These caribou belong to the Kaminuriak herd which is centered around Chesterfield Inlet in the central Keewatin area. Up to the early 1970's the Seal River was well within the herd's range. Today, however, the herd occupies only a small portion of northern Manitoba, with small pockets extending further south.

Other species of terrestrial wildlife include moose, black bear, wolverine, marten, hare, lynx, wolf, beaver and muskrat, otter and fisher. Approximately 10,000 geese and waterfowl use the Seal River as nesting, molting and migration (staging) habitat (Larch, 1972). Most of the geese which nest on the river belong to the eastern prairie breeding and migration range, which winter in the

states of Iowa and Missouri. Typical waterfowl species include the merganser, black, white-winged scoter, scaup and bufflehead ducks. Populations of bald and golden eagles, ospreys, terns, gulls and a variety of song birds are found along the river.

Fish species inhabiting the river include lake trout, arctic grayling, northern pike, whitefish and several scavenger species. Arctic char frequent the estuary during certain times of the season. As there has been little sport and commercial fishing along the system, these populations remained virtually untouched.

One species of amphibian, the wood frog, occurs in the Seal River area.

Overall, the transitional forest will not support large populations of animals, but the species found here are virtually undisturbed. Opportunities for viewing and photographing wildlife such as wolves, moose, seals, bears and Canada geese are numerous.

2.2 Human Resources

Archaeologists have identified remains from two major stages of native prehistory in the Seal River area (Nash, 1975). The oldest era is the Paleo-Indian period, which began 8,500 years ago when the glacial ice began to retreat across northern Manitoba. The vast majority of the artifacts found have been attributed to the Archaic period, which began approximately 6,000 years ago.

The culture which has been identified in the Seal River area is known as the Taltheili Tradition. The Taltheili Tradition represents a long, continuous period of conservatism which existed in northern Manitoba between 1 A.D. and 1700 A.D. During this tradition, the native people developed a nomadic strategy geared primarily to the migration of the caribou and to fluctuations in fish populations

(Nash, 1975). Several significant and highly sensitive archaeological sites were discovered during field investigations. Many artifacts lie exposed to the elements.

Despite its remote location, the Seal River has played an interesting role in Canadian history. In 1770, Samuel Hearne travelled up the Seal River enduring almost unbelievable hardship and misfortune in an attempt to reach the Northern Ocean, as the Arctic Ocean was then called. Hearne spent several weeks at Shethanei Lake while preparing to enter the barrenlands in search of legendary copper mines.

The historic and present day inhabitants of the Seal River area are the Athabascan speaking Chipewyan, also known as the Caribou-eaters, People of the Rising Sun, Dene-Sagise or Dene. Most of the eastern Dene now reside at Tadoule Lake, the largest lake on the Seal River system. The band was originally located at Little Duck Lake south of Nejanilini Lake, about 90 kilometers north of Tadoule Lake. In 1956, when the Hudson Bay post at Little Duck Lake closed, the Department of Indian and Northern Affairs resettled the band to Churchill. The Dene could not adjust from a life of trapping, hunting and fishing in the forest to one of dependency on social assistance on the unfamiliar tundra. Population decline and a collapse of their social structure prompted the band to pack up and move back to their traditional lands in 1973. The site at Tadoule Lake was chosen because of its natural setting and availability of fish and wildlife, especially the caribou. The story of these people and their courageous determination to resettle in their traditional land is a fascinating aspect of the human heritage of the area.

Three Chipewyan and white trappers' cabins are found along the river. None of them are in use and all have caved in. A mining exploration camp with several buildings in excellent shape is located at the east end of Great Island. These structures are easily accessible and are a rare opportunity to glimpse a passing way of

life. They are also highly susceptible to recreation pressure, and the implications for management of this resource are described in later sections.

2.3 Recreational Resources

The primary recreation asset of the Seal River is its true wilderness experience. Canoeing is the most popular form of recreation on the Seal River. A trip from Shethanei Lake to Hudson Bay takes ten days to four weeks and is rated for expert canoeists only. Hazards such as rapids, ledges, falls, submerged boulder fields, swift-flowing water and rough terrain make the Seal River an extremely demanding waterway.

The use of rubber rafts equipped with outboard engines is a suitable alternate form of transportation. Rubber rafts eliminate the need for portaging in most cases, and reduce the danger factor.

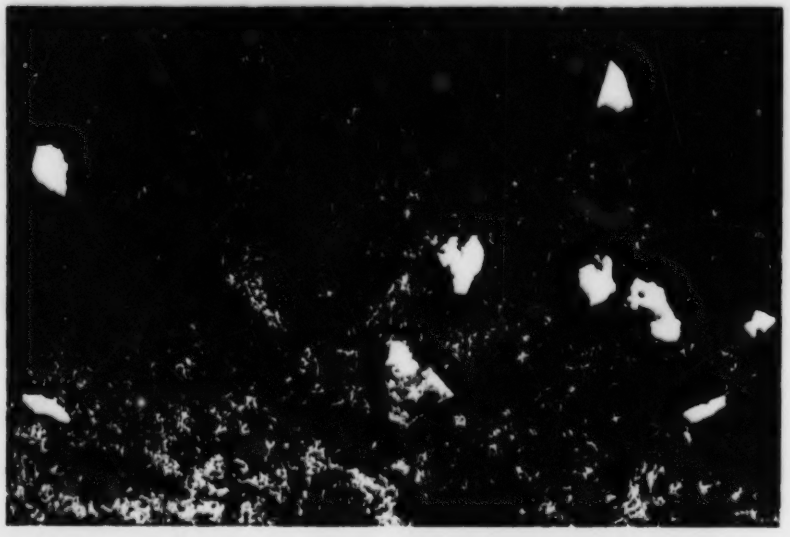
Accurate figures are not available for the number of recreationists travelling the river. Overall, the river receives very little use, with an estimated 10 to 20 parties reaching Hudson Bay annually. There is really no common embarking point, as there are several different ways of reaching Shethanei Lake by boat. Starting points include Flin Flon, Lynn Lake, Big Sand Lake and other communities on the watershed. The Manitoba Department of Natural Resources has published a canoeing map entitled "Land of Little Sticks Route" which describes the Seal River route and recommends a variety of starting points.

There are many recreational opportunities associated with the Seal River. They include fishing, hiking, wildlife viewing, enjoying scenery, history appreciation, photography and the seclusion of the wilderness. This variety of recreation experiences are discussed in greater length in section 3.5.

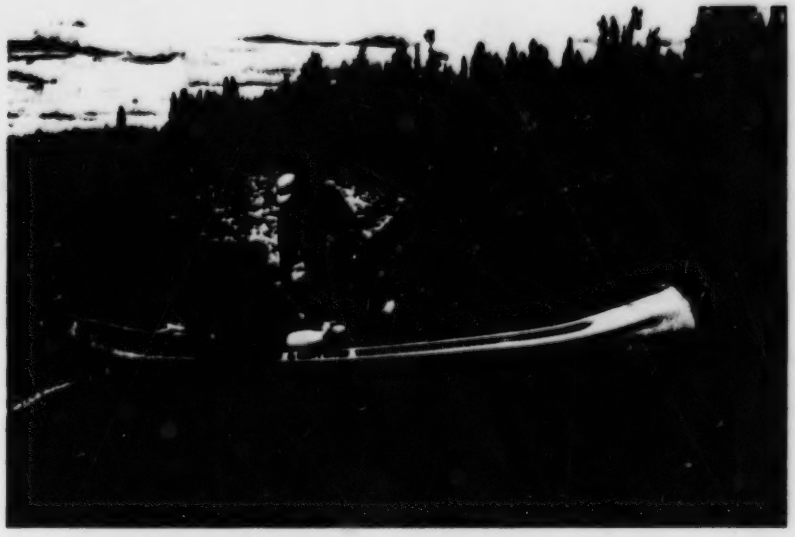
This overview has described the natural and human environment of the study area, with only brief mention of some of the many resources, features and recreation opportunities which give the Seal River its value. A more detailed description of these resources follows in the next section.

5. Great Island Gorge
Rock Formation
(Site 15)

6. Esker at Great Island Gorge (Site 15)



7. In Situ Remains from a Prehistoric Tool-making Site (Site 3)



8. Canoe Party at West Great Island (Site 14)

3.0 IDENTIFICATION, DESCRIPTION AND ASSESSMENT OF HERITAGE RESOURCES

The purpose of this section is to identify, describe and assess the heritage resources of the Seal River in greater detail. Descriptions of the various segments and sites provide a close-up view of the river and an appreciation of its recreational experiences. This is followed by further discussion of the natural, human and recreation values introduced in the overview and highlighted in segment and site descriptions.

Map 4 shows the location of segments, sites and rapids, and outlines the features at each site. Rapids are rated on a scale of one to six based on the International Whitewater Rating Scale.

3.1 Segment Descriptions

Five different segments were identified from Shethanei Lake to Hudson Bay. As previously noted, segments were selected on the basis of groupings of similar characteristics along the river.

Segment 1: Shethanei Lake (Sites 1 - 5)

Shethanei Lake, a 40 kilometer long, glacially scoured water body, marks the point where the North and South Seal Rivers converge. The lake is characterized by dark, fairly shallow water with numerous reefs and islands which make navigation hazardous. Waves can reach dangerous proportions in minutes, as much of the lake is wide open. It is not uncommon for boaters to become wind-bound for several days on Shethanei.

The area around the lake contains some of the most diverse relief along the river's course. Several eskers intersect the lake, including one which protrudes into the water for almost one kilometer, as a narrow, sandy ridge. Huge blow-outs, or areas where the esker

has eroded into sandy fields, are located within walking distance of all the eskers. As the lake narrows, the strong current has eroded the face of the Shee-than-nee esker and has created a large, scenic spit of sand and gravel. A major drumlin field is located at the east end of the lake and a large crag-and-tail bedrock hill is found at the west end of the lake. Several beaches line the shores of this lake.

Shethanei Lake was an area of considerable human activity during its history. The multitude of chips, flakes and even arrowheads which lie exposed at several sites found during field investigations are testament to this fact. In more recent history, Samuel Hearne camped here for several weeks while he prepared to enter the barrenlands.

Excellent campsites are plentiful and the fishing can always be relied upon to produce large lake trout or northern pike.

Segment 2: (Sites 6 - 13)

This segment has an extremely variable channel with generally low banks and numerous sets of choppy rapids. At one point, the river follows a narrow, deep gorge which was probably formed before glaciation, making it somewhat of an anomaly. The Wolverine River joins the Seal River along this stretch. The Wolverine drains the northern part of the watershed, which emanates from the Northwest Territories and flows through Baralzon and Nejanilini Lakes to the north. Located just downstream of the outflow is a major esker, one of the most pronounced glacio-fluvial features found along the Seal River. A long esker parallels the river in the lower reaches of this segment. Significant numbers of worked stone fragments and finished tools were located in the segment. Campsites are numerous and angling for grayling is excellent. This segment terminates at Great Island, at which point the river divides into two channels.

Segment 3: (Sites 14 - 19)

This segment consists of the south channel of the river along Great Island. Great Island is assumed to be a mammoth geological structure, however, its origin is unknown. In the upper reaches, a long, scenic gorge comprised of an esker on the south bank and shale cliffs on the north pinch the river into a fast-flowing stretch. Several long, shallow sets of rapids occur in this segment, including a relentless three kilometers of uninterrupted whitewater (Site 18). Here, the high rising, uniformly shaped river banks are devoid of permanent vegetation, the result of ice-scour which reaches up to 25 meters into the backshore, and whose force can move large boulders.

Significant archaeological remains are found in this segment. The mining exploration camp is located at the confluence of the north and south channels. From this point on, their is little evidence of past human activity. This abrupt decrease in archaeological evidence from the east end of Great Island would suggest that the Indians did not travel beyond this point. This may be because the river now begins to flow through the beginning of the Arctic tundra life zone and the traditional Inuit territory.

Campsites are less frequent along this segment, and the recreationist may find himself setting up camp on sites which do not equal previous campsites in terms of overall quality. Angling, however, is productive but not as good as earlier segments.

Segment 4: (Sites 20 - 30)

This segment marks the beginning of a new life zone, the tundra. Peat polygons, treeless heaths, thermokarst lakes, and other permafrost features are common, and the cooling effect of Hudson Bay, colder temperatures, fog and increased rain and drizzle become more noticeable.

The Tyrrell Sea once covered most of this area in its history and, therefore, glacial features and deposits are non-existent. The river channel in the upper reaches is uniformly wide and shallow with many weed beds. The last few beaches are found in this segment, usually alongside collapsing banks where the permafrost has thawed and the sand and soil have broken up. A small, immature delta has begun to form closer to Hudson Bay, and several islands mark this point where the river begins to flow close to base (sea) level.

Navigation through these islands is difficult and the use of 1:50,000 scale maps or air photographs is necessary. It is recommended that recreationists allow for extra time to navigate the delta, especially if one is precisely timing the arrival at Hudson Bay at high tide. This segment concludes at Deaf Rapids, where the river makes a ten meter drop into the estuary.

Segment 5: (Site 31)

A dramatic change is evident at Deaf Rapids. No trees are visible, as this is the first area of true, continuous tundra. The estuary zone is characterized by a labyrinth of channels, rapids and ledges which must be navigated more through trial-and-error than through the use of the maps. The wide-open expanse of huge boulders, water and ocean, and the sight of belugas feeding in the shallows is a thrilling end to a wilderness journey.

3.2 Site Descriptions

Thirty-one sites within the five river segments were inventoried. These sites exhibit a variety of resource values and are described below. The abbreviated features code for each site (also shown on Map 4) is explained on page 31.

KEY TO MAP 4

RESOURCE FEATURES

Natural Resources

A - Alluvial Feature
B - Beach
C - Crag-and-Tail
D - Drumlin
E - Esker
F - Felsenmeer
G - Gorge
H - Pothole Drilling
I - Spits and Bars
J - Outwash Feature
K - Bedrock Outcrop
L - Marine Delta
M - Meander Scars
N - Bog Veneer
O - Erosion Scarp
P - Peat Polygon
Q - Strata
R - Fractures
S - Estuary
T - Peat Plateau
U - Dunes
V - Cleavage
W - Blow-outs
X - Botanical Anomaly
Y - Syncline
Z - Terrace

Human Resources

A - Active Campsite
B - Birch Bark Rolls
C - Cores
F - Flakes
G - Grave Site
H - Hammerstone
M - Mining Camp
N - Historical Camp
O - Petroform
P - Projectile Point
R - Fire Ring
S - Scraper
T - Hide Cutting Stone

Recreation Resources

A - Angling
B - Bird Watching
C - Campsite
H - Hiking
P - Photography
R - Rock Hounding
S - Sketching
T - Trappers' Cabin
V - Viewing (landscape)
W - Wildlife (observation)

1 Shethanei Lake Segment

2 Upper Seal River Segment

3 Great Island Segment

4 Lower Seal River Segment

5 Est
Segm

Big Spruce River

Wolverine River

North Seal River

Shethanei Lake

Great Island

Nine Bar Rapids

Bastion Rock

Deaf Rapids

Esker

Rapids

International Whitewater Rating 1 - 6

Site Numbers 1-31

Segment Numbers 1-5

25 0 25 5 10
km

MAP 4

SITES, SEGMENTS AND RAPIDS

Features Code

Site 1: Hearne's Campsite

Natural: K,C,N,T
Human: N
Recreation: H,V,P,A

Located at the west entrance to Shethanei Lake at the outlet of the South and North Seal Rivers, this pronounced hill is the possible location of Samuel Hearne's spring camp of 1770, as inferred from his journals. Further investigations of this area should be made to confirm that this was indeed where Hearne camped. A diversity of landform types and broad vistas of the lake and shorescapes, as viewed from the elevated knoll, adds to the attractiveness of this site.

Site 2: Crag-and-Tail Campsite

Natural: B,K,C,N
Human: F,R,P
Recreation: C,H,V,P

This site is one of many potential starting points for a trip down the Seal River. There are two separate beaches, both well sheltered by a small island, where float planes can safely dock. A narrow, sandy backshore and a gradually sloping bog veneer surround a bedrock anomaly which rises in striking contrast to the flat terrain around it.

The west beach is made up of spits, wave-cut terraces and ice push-ups. A walk down this beach will captivate the hiker's attention with the variety of shapes, sizes and active processes in this small area. Small pools and bluffs of wetland vegetation provide excellent habitat for shorebirds, minnows, snails, etc. This beach, like many along the river, is a rock hound's paradise. Literally hundreds of rocks and minerals are found exposed, including biotite schists, sandstones, quartz and conglomerates, just to name a few.

This site is noteworthy for its potential for camping. It would be an ideal initial stop after entering Shethanei Lake through the North or South Seal Rivers. Immaculate, well-used campsites with rock ovens are found along beautifully layered beaches. An island immediately offshore provides shelter from the winds and waves which can reach dangerous proportions.

Two noteworthy geomorphological features occur at this site. The most prominent is a striking crag-and-tail bedrock drumlinoid feature which rises approximately 30 meters high. Blocks of granite as big as eight meters in diameter are piled irregularly on top of each other, forming hundreds of cave-like hollows and caverns and creating the impression that they may topple at any time. A few birch trees have managed to get a foothold on the hill, which is an interesting adaptation to an environment devoid of soil and exposed to the elements. Other plant species tend to occupy the wind-sheltered lees and are of a subarctic life form known as variation alpinus. Red squirrels were found to inhabit the hill and it is probable that the black bears hibernate in the hollows.

The other interesting feature is a drainage channel, or runnel, from a small bog area which flows to the west beach. The strata of the soils are clearly visible along the walls of the incised channel, which cuts about 1.5 meters into the loamy soil.

Site 3: South Shore Shethanei Esker

Natural: B,E,W,U,N,X
Human: G,P,F,S,B,A
Recreation: H,V,P,B,S,W
Photograph: #7

This is one of the several beautiful esker sites on Shethanei Lake. It may be the most interesting site of any on the Seal River, owing to the diversity and concentration of the landforms, wildlife and human resources found here. This site consists of a flat

peninsula which extends well into Shethanei Lake at the end of an esker. A picturesque kettle lake and a long sand beach make this site one of the highlights of a trip down the Seal River.

The most noteworthy aspect of this site are its human resources. This site was undoubtedly the primary campsite on the west half of Shethanei Lake because of its excellent camping qualities and its location along a major caribou migration route. The abundance of prehistoric and historic artifacts discovered at this site attest to the relatively high level of human activity which occurred here. On the beach, very close to the water level and lying fully exposed, were hundreds of chips and flakes, and some scrapers and arrowheads. When it is considered that each year the ice disturbs a layer of sand, the number of exposed artifacts found here is quite phenomenal. Artifacts of a more recent age were also discovered. Deteriorating rolls of birch bark, one-third of a meter wide and one meter long, probably at least 40 years old, were discovered inland near the base of the esker. Some Tadoule Lake residents remember a time when canoe makers would come from several miles around to Shethanei because of the abundance of birch trees here. Apparently, these rolls were intended to be used for canoe construction but were left behind. As well, at least four graves were found on the esker, all of which were marked by crudely hewn crosses or the remnants of fences, indicating Christian burials. These graves are probably about 100 years old.

The transition from high esker to forest, and exposed flat-land to beach, and water, all in a very short distance creates interesting habitats for a variety of fauna and flora. This esker is obviously a major travel route for wolves, bears, moose, fox and other animals. Tracks are evident over most of the fine sand on the esker. The kettle lake and lakeshore environments compliment each other and numerous shorebirds, such as the semi-palmated plover and yellowlegs, concentrate here. The flora is typical of the area, except for a large stand of birch trees which occurs on the higher, well-drained areas.

This site provides some outstanding recreational opportunities. Because of its peninsula shape, there is easy access from the beach to sheltered and well-drained campsites with a variety of aspects. The esker can be hiked comfortably for several kilometers into the bush to enjoy and appreciate wildlife and landform features. From on top of the esker near the shore is a panoramic view of the esker as it continues its winding track north of Shethanei Lake. This view is one of high, sandy hills and beaches whose beauty and contrast was noted by Samuel Hearne in his journals. It is well worth at least a one day stop-over.

Site 3 would make an excellent starting point for a boat trip down the river. The site's archaeological importance and the possibility of artifact removal are future management concerns.

Site 4: North Shore Shethanei Esker

Natural: E,W,B,X
Human: F
Recreation: C,H,V,P

This esker is a continuation of Site 3 which bisects Shethanei Lake in its western half. It is probably the most visible point on the lake because of its huge sand beach and rolling hills which are the highest points around.

Access to the esker is through a long, shallow channel which would be difficult to follow in times of low water. Once the base of the esker is reached, however, a quick walk to the top affords a spectacular view of Shethanei Lake. To the east, the view extends as far as the Shethanei Lake narrows, or Shee-than-nee. To the west, both the mouths of the North and South Seal Rivers are visible. From this vantage point, the myriad of islands and reefs over much of the lake are visible.

Apart from the spectular view, this esker lacks the variety of historical artifacts found to the south. The botanical composition and structure of the plant life are quite unique on the exposed, wind-eroded dry ridges, and several species of songbirds prefer this harsh ecological niche as habitat.

Site 5: Shee-than-nee

Natural: E,B,I,W,U,X
Human: G,P,F,R,T
Recreation: G,H,V,P,W,B

This is the legendary "high hill running into the lake" or "Shee-than-nee" where Samuel Hearne spent several weeks in the winter of 1770 preparing to enter the barrenlands to the north. This is the narrowest part of Shethanei Lake where the esker terminated in a swift flowing, shallow part of the lake. The detritus, or wash, from the esker has formed a picturesque sandy and gravelly spit which extends about 25 meters into the water. This spit and the esker are among the most scenic spots on Shethanei. A bluff of birch and aspen trees, located on a flat, well-drained site offers a comfortable and impressive camping experience.

The beaches here are also littered with chips, flakes, and partially worked projectile points, indicating a high level of human use. No doubt this was once a major caribou crossing point. A trapper's cabin is located near the esker along-side a shallow kettle lake resembling a lagoon. Nearby sled dog kennels are reminders of a way of life which has passed into history.

The esker itself is a fascinating and beautiful phenomenon. It extends right to the lake from the northern half of Shethanei Lake, where it snakes through the water as a narrow, stoney, water-worked rib only 50 to 100 meters wide. It continues in a south-easterly direction for 10 kilometers along the mainland. Huge stands of jack pine and birch trees are found along the esker. Years of erosion have created the sand spit which now rises just above the water level at

the narrows where it empties into the lake. To the east is an extensive system of blow-outs, or areas where persistent wind, rain and snow have eroded what was once a high esker into several flat, bowl-shaped fields of fine sand. Pioneer lichens and mosses fight an endless struggle to stabilize the eroding dunes, often creating unique circular, square and polygonal designs on the sand. A myriad of mammal tracks can usually be found in the soft sands.

Another noteworthy feature of "Shee-than-nee" was the number of song and shorebirds. Warblers, thrushes, plovers, terns and gulls were observed and heard at all hours of the day and night.

Site 6: Shethanei Drumlin Field

Natural: D,B,N
Human: F,P
Recreation: C,H,B,A

One of the most extensive drumlin fields in northern Manitoba is located at the east end of Shethanei. The terrain is characterized by low drumlin hills interspersed with bog veneers, peat plateaus and kettle lakes. The landforms are oriented in a northwest direction, indicating the direction of glacier movement. Visual impact from the air is quite impressive, but one cannot grasp the significance of the site from the ground.

Site 7: Wolverine River Mouth

Natural: A
Human:
Recreation: A,D

The Wolverine River empties its colder water into the Seal through a shallow, rocky bog. A set of rapids and boulder gates make boat travel up the Wolverine impossible without portaging. Excellent grayling fishing is found at the mouth of the river and throughout the bay.

Site 8: Esker

Natural: E,W,U,J,K,X
Human: G,R,F,L,S
Recreation: H,V,P,S,C,A
Photograph: Front Cover

This esker is one of the most pronounced glacio-fluvial features found along the river. The river is actively eroding the west portion of the esker and a 30 meter sand scarp has been formed, which reveals the composition and stratification of the sand, silt, gravel and boulder layers. An exciting set of class three rapids is found at the base of the esker, where a series of bedrock ledges and shelves protrude into the channel. Inland, the esker branches into several huge blow-out fields and high ridges, and can be followed for several kilometers north past kettle lakes, bogs and forest.

One human grave, two fire pits and two worked quartz cores were found. Overall, the number of artifacts found here would suggest that there was less human activity here than at some of the previous eskers.

This esker offers very attractive vistas of the surrounding terrain from an elevation of about 30 meters above the river.

A good campsite is located southeast of the esker on the opposite bank. This site is a continuation of the esker, but it has been levelled and terraced from past river erosion. Because of exposure to the elements, this peninsula supports tundra-like plant life. Also, many of the plant species found growing here are not common to the area and it is assumed that the seeds were water transported from more southern and western botanical regions.

Site 9: Gorge

Natural: E,W,U,J,K,X
Human:
Recreation: H,V,P,S,A

About 15 kilometers west of Great Island, the river passes through a pre-glacial channel for over a kilometer. The gneissic granite walls are about 30 meters high, and it is estimated by geologists that such a straight and deep channel could not have been cut in post-glacial times. It is, therefore, a remnant of a time which has been erased by the last ice age.

Site 10: Outwash River Terrace

Natural: O,Z,W
Human: F,R
Recreation: H,V,P,S,C

This site is a classic example of an outwash terrace and consists of a level, sandy plateau nearly devoid of vegetation. It is an excellent campsite, owing to the well-drained, flat terrain and excellent fishing at the nearby rapids. A 40 meter sand scarp, visible across the river, is a continuation of the deltaic deposit which forms the sand field.

Several small animal burrows were discovered at the north end of this sand field. Large, climate-hardened jack pine occur throughout the field.

Site 11: Big Spruce Delta

Natural: A,W,M,U,X
Human: F
Recreation: H,V,P,W,X,S
Photograph: #15

The Big Spruce River delta, a maze of oxbow lakes and meander scars, was formed thousands of years ago when the Tyrrell Sea inundated this area. This isolated delta environment provides habitat for a variety of plants and animals. A stand of large spruce trees, many of which tower ten or more meters is most noteworthy.

Site 12: St. Croix Island

Natural: E,B,I,J
Human: C,P,F,S,R
Recreation: H,V,P,W,S,L

St. Croix Island forms part of an outwash and esker complex. The island possesses extensive beaches and spits with many sand bars occurring in the back channel. Numerous chips, flakes, stocks, projectile points and fire rings were found exposed on the beach and island. The abundance of artifacts found in this area around Great Island would suggest that this was once an area of considerable activity. It is likely that the areas to the west of Great Island and Shethanei Lake were the two main points of activity along the river.

Site 13: Lavallee Channel Esker

Natural: E,W,X,K
Human: F,S,H,R,C,T
Recreation: H,V,P,S,C,W

This esker is located at the west end of Great Island in one of the most diverse and beautiful areas along the Seal River. It begins at the mouth of the north channel where the river flows into two channels around Great Island. The area on the west end of Great Island consists of a maze of islands, sand and weed bars, beaches, spits and stands of emergent vegetation. This tremendous diversity in river morphology and life is set against the backdrop of the awe-inspiring Great Island which rises majestically some 275 meters above sea level and 100 meters above the Seal River.

The esker itself branches into two ridges with a few kettle lakes and follows the north shore of the Lavallee Channel. Many artifacts were discovered at the foot of the esker and along the top ridges closest to the main Seal River. Literally hundreds of stone artifacts litter the base of the esker, which provides an excellent campsite and resting spot before setting off down one of the two channels.

About one kilometer down the north channel, the river is pinched off by exposed rock, creating a set of roaring rapids. Uplifted bedrock-sheer planes are found at these rapids. Two pothole drillings, which are small, scoured depressions formed by the action of water and gravel during glacial times, lie today about 1.5 meters above the water surface. The numerous cleavage planes have formed striking angular rock formations in seemingly unnatural patterns. While the esker is about two kilometers off the main channel, it is well worth the side trip for canoeists and boaters. The view of the northwest portion of Great Island from the foot of the esker is another of the many impressive sights along the river.

Site 14: West Great Island

Natural: E,W,U,B
Human: F
Recreation: H,V,P,S,C,A
Photograph: #8

The esker plateau at this location is one of the most picturesque campsites found along the Seal River, offering an unobstructed view of the sun setting below the high ridges to the west. A set of class four rapids sits adjacent to the campsite at the start of the south channel. The grayling fishing and scenery at these rapids are excellent. Several ledges traverse the river, creating cauldrons and turbulent water.

Site 15: Great Island Esker

Natural: E,W,K,G,V
Human: F
Recreation: H,V,P,S,C,B
Photograph: #6

The esker ridge towering above the river at this location offers an open view of the river channel and the unique bedrock features on the opposite river bank. This is probably the most distinct and memorable stretch of the river. A gorge has formed, with an esker on the south side and sheer cliffs on the north. These cliffs are distinctly different from any others along the river as a

result of their lithology and morphology. The gorge cliffs are comprised of sedimentary rocks, with major deposits of shale and carbonate. The latter deposits have fractured into hundreds of blocks of needle-like fingers which are thrust into the air or have fallen in piles at the shore. This fascinating example of exfoliation and mass wasting is continuous along a two kilometer stretch. Salt crystals and iron oxide staining are also evident.

These features can be viewed from the south shore esker or up close. Immediately upstream of the gorge the river widens and a panoramic view of islands and ledge rapids creates a lasting impression. Seals are quite often seen along these widenings in the river as they forage for fish.

Site 16: Bedrock Promontory

Natural: K,Y,R,G
Human:
Recreation: H,V,P,S,B,A
Photograph: Back Cover

This site is undoubtedly one of the most spectacular features on the river. A monolithic pillar of bedrock rises out of the water and towers 30 meters high. The sheer cliffs of this iron-stained, synclinal feature dip almost vertically at about 70 degrees. The river flows around the base of the rock, forming two separate channels. Along the main channel, class five rapids converge into a swift-flowing chute with a series of 1.5 meter standing waves.

On the river's east shore, easily accessible cliffs provide a superb vantage from which to view the rock and the rapids. Photographic opportunities here are unsurpassed anywhere else along the river, and quite possibly in all of northern Manitoba. The avid photographer may well want to spend a day at the rock in order to catch the sunlit facets of the structure.

Dozens of cliff swallow nests are built along the cliff faces and overhangs along the rocks. This is the furthest north these birds will nest. They are extremely susceptible during times of bad weather when they may be unable to catch winged insects or when insect populations are down.

This site is certainly a highlight of a trip down the Seal River. The monumental size and sharp lines of the rock, combined with roaring rapids and a turbulent chute, create a lasting impression.

Site 17: Esker Base

Natural: E,K,N
Human: F,R
Recreation: C,A

A moderately suitable campsite exists at the base of an esker on the south shore. While the shoreline is rocky, the area is well-drained and sheltered, and excellent grayling fishing can be found within walking distance. The esker itself is not visible from the water or the campsite, but it may well be worth the short hike to reach it, as numerous artifacts were found here. Fire rings and quartz chips and flakes litter the ground under the mat of caribou moss.

Site 18: 9-bar Rapids

Natural: K
Human:
Recreation: V,P

This is the longest continuous stretch of rapids on the river, running some three kilometers from start to finish. The water is shallow and infested with boulders, rock ledges, drops and shallows. Because of the number of hazards and the length, the rapids are rated as a class five. It is recommended that the rapids be portaged or lined, since their sheer length does not permit planning for a safe course down the entire channel. Rubber rafts fare better, however, the rapids are quite tricky and demanding even with the added safety a raft provides.

Site 19: Mining Exploration Camp

Natural: A,I,X
Human: M
Recreation: H,V,P,L
Photograph: #13

This camp is located on the east end of Great Island. It was operated by the Great Seal Prospecting and Developing Syndicate 1953, and was active during the 1950's.

The camp consists of several log buildings, including a main building with the roof still intact. Most of the inside has been preserved from the elements and deteriorated clothing, bedding, food tins, pots and pans, etc. show what life was like for the northern prospector. Other buildings on the site include a dynamite storage shack, outhouse, second accommodation building, food storage cache and a six meter high drilling platform.

Remnants of exploration activity are scattered throughout the site. A six meter freighter canoe, in almost usable shape, lies near the main building and a standard dog-pulled toboggan of about three meters in length is still intact. Outboard engine parts, gas drums, saws and a variety of discarded items such as old core samples are highly representative of the mining exploration camps which were in operation in the north during the 1940's and 50's.

Exploration at this area turned up samples with 35% to 37% metallic iron content. This was not a high enough concentration of economic minerals to warrant any mining activity and the camp was abandoned. It has remained virtually untouched since the 1950's and a walk through the buildings provides a fascinating glimpse into the prospector's life.

Site 20: Bedrock Structure

Natural: K,V,C,N,X
Human:
Recreation: H,V,P,S

This site consists of a long and highly visible bedrock outcrop located along the south shore. It has been glacially altered, as illustrated by its drumlinoid shape and the presence of erratic boulders with striations on the horizontal surface of the bedrock plane.

From a distance, the hill appears to be a strange lime green colour, caused by the crustose lichen and miniature shrub growth species which have taken hold on the rocks. During daylight, the contrast against the flat, dark terrain is quite striking.

The hill is situated at the point where ancient marine seas (the Tyrrell Sea) inundated the present landscape, approximately 90 kilometers from the Hudson Bay coast. From here eastwards, marine action and crustal uplift have been the major influencing factors in shaping the terrain, resulting in features such as terraces and rough-cut channels, replacing glacial features such as eskers and sand deposits. In this area, the harsh subarctic climate of Hudson Bay begins to influence the vegetation of the area. Looking eastward, the vegetation gradually changes to open, treeless tundra heath and peat polygons, with the only tree growth of stunted black spruce and tamarack occurring near the river and its tributary streams and creeks. To the west is one of the last views of the open black spruce forest. The anticipation of the changing environment towards Hudson Bay is heightened by viewing and contemplation on top of this pronounced bedrock plateau.

Site 21: First Tundra Forms

Natural: P,T,O,X
Human:
Recreation: V,P,A
Photograph: #14

At this point, the first open patch of tundra heath is visible, and it serves as an illustration of what can be expected as the river enters a new life zone. This life zone adds a new ecological dimension to the environment, since the conditions now profoundly alter and restrict plant growth.

Site 22: Beach Campsite

Natural: P,T,J,O,B,I
Human:
Recreation: C,P,V,H

This site is one of the first examples of tree line plateaus which become common a few kilometers downstream. The foreshore consists of a thin strip of unstable beach with a sudden rise of about seven meters to the backshore. As the permafrost becomes exposed along this scarp, the loamy soil collapses down onto the beach. The backshore is covered by a narrow band of spruce and tamarack which gives way to the treeless peat plateau. Sporadic deterioration of the underlying permafrost has resulted in barely visible peat polygons and the creation of small thermokarst lakes and ponds. The peat deposits are underlain by a thin veneer of waxy steel-gray marine clay sediments.

At this stage of the journey the traveller will be impressed by the changing landscape and the realization that he is entering a new life region. After the kilometers of virtually uninterrupted spruce forest, these open areas of treeless heath are a dramatic change.

Site 23: Raised Peat Plateau Island

Natural: A,O,P,Z,X
Human:
Recreation: V,P,B

This site is a raised peat plateau island and is the first true example of the peat polygons characteristic of the tundra. Typical flora species include Ledum decumbens, Impegrum negrum, and Vitisidae cladina, all underlain by a thick layer of peat moss. Small erosion blow-out features are found on the east bank of the island, exposing the layer of brown peat underneath.

This island is a good resting spot after a considerably long and treacherous set of rapids. The absence of trees, however, makes it a poor campsite.

Site 24: Beach Campsite

Natural: B,O,W,I,A
Human: A
Recreation: C,A,V,P,W

An excellent campsite is located along a stretch of this beach. The beach itself allows good access to the sheltered tent sites which are found just over top of a seven meter sand scarp. Large blow-out features with inland ponds also offer an interesting hiking experience.

Site 25: Alluvial Deltaic Island

Natural: B,I,W,U,X
Human: A
Recreation: C,H,V,P,W

This low-lying island was once a large sand bar which later emerged to form a sandy terrace. Wind erosion has since formed large dunes along the exposed west shore. A bouldery sand beach extends the full length of the island. The white spruce and birch have developed unusual rooting systems to adapt to the exposure and force of the wind.

This is one of the last good campsites on the river. The remainder of the journey to Hudson Bay involves some rough boating and terrain, so this island is an excellent spot to prepare for the last few kilometers, as well as to explore.

Site 26: Felsenmeer

Natural: F,P,K,X
Human:
Recreation: H,V,P

Between sites 25 and 26, the river forms a gradual loop and becomes increasingly wider with many large, sandy islands, spits and bars. Extensive stone fields and boulder trains known as felsenmeer, peat ploygons and thermokarst lakes become common. Where the felsenmeer extend into the river, long sets of treacherous, shallow rapids occur. Three or four major felsenmeer deposits occur, mostly in the areas closer to Hudson Bay.

Site 27: Cove

Natural: K,R,F,H,V
Human:
Recreation: H,V,P,S,A

An extensive outcrop of bedrock alongside a boulder train occurs after a stretch of rapids. The result has been a cove-like rock formation with a myriad of rapids and ledges. Mud and sand bars have formed between these ledges, creating pools where grayling fishing is productive.

Site 28: Tamarack Island

Natural: P,K,L,X
Human:
Recreation: H,V,P,W,B

An interesting resting spot is found on an island in a boulder-strewn stretch of the river. On this island are several large tamarack trees, some of which are 50 centimeters in diameter and reach 15 meters high. These trees are estimated to be 250 to 300 years old. On the north side of the island, at least 12 caribou racks were found,

indicating that this was a crossing point or a congregation area. At the upstream point of the island, seals were seen sunning themselves on the huge boulders scattered throughout the water. Campsites along this reach are almost non-existent, although the open tundra upland would provide level but exposed tent sites. Throughout this area, marine sediments prevail, blanketed by deep peat deposits.

Site 29: Delta

Natural: A,K,F,P,H,L
Human:
Recreation: V,P,W,B

At this point, the river begins forming a delta as it flows closer to Hudson Bay. This delta is relatively undeveloped compared to that of the much smaller Knife River just to the south. It appears that the Knife Delta may have been the original terminus of the Seal, and the Seal River Delta is a product of a newer channel. The result has been the formation of a maze of terraced islands, rapids, shelves and reefs that are quite tricky to navigate and scout. This close to Hudson Bay, a thick blanket of fog can reduce visibility so care must be taken to avoid hazards. This holds especially true for the last large set of rapids known as "Deaf Rapids" which can easily sneak up on the unwary or fog-blinded boater.

Site 30: Deaf Rapids

Natural: K,F,P,X,L
Human:
Recreation: H,V,P,S,W,B

This is the final stop before entering the estuary at Hudson Bay. The rapids here drop about eight meters over a length of 500 meters, resulting in a tumultuous chute of water with boulders, ledges and standing waves in excess of two meters high. These rapids are curiously silent on the approach, thus the nickname of Deaf Rapids. The chances of a canoe successfully running these rapids is slim. A rubber raft with an outboard engine can shoot them if care is taken.

Deaf Rapids is another highlight of the trip for a number of reasons. First, the rapids signal the journey's end, even though the estuary contains a myriad of ledges, rapids and other hazards. Second, the change from tundra terrain to marine flats is quite abrupt and noticeable. No trees are visible and the plant life is true and uninterrupted tundra species. Finally, the feeling of elation felt by the travellers who have travelled almost 300 kilometers of harsh, beautiful country along the Seal River is something that descriptions cannot portray. A chance meeting with polar bears is quite possible, and care must be taken to keep a clear view of the area.

Site 31: Estuary

Natural: S,K,F
Human:
Recreation: V,P,W,B
Photograph: #11

At the end of Deaf Rapids, the river abruptly changes from a narrow channel to a tidal zone which consists of a labyrinth of huge boulders and a staircase of ledges. Navigation through the network of rock islands and rapids is quite tricky. Several paths may be taken, although it is best to stay on the north side of the estuary. The view is quite spectular — a desert of rocks and boulders as far as the eye can see. If the tide is in, the beluga whales may be breaking the surface in as little as two meters of water. Once past the shallows in the estuary, the traveller has the unique opportunity to experience a fascinating natural event — the belugas feeding in the shallows. The whales often come right up to the boat if it is quiet and their high-pitched squeaks and squeals may be audible. The concentration of belugas here gives the Seal River estuary national significance. Hudson Bay must be entered just before or at high tide, since the ebb and flow fluctuates between three and five meters. Tidal charts should be used to time the entrance into Hudson Bay.

The five segments and 31 sites contain a wide variety of common, unique, rare and significant features and resources, and outstanding recreational opportunities.

3.3 Natural Resource Values

C.H.R.S. guidelines require the consideration of a variety of factors such as important processes and features, rarity, uniqueness and experience. The remainder of this section sets the stage for evaluation of the resources against specific guidelines in Section 4.0. The discussion below elaborates on geomorphic features and processes, important plant and animal life, human heritage resource values and recreational values and opportunities.

Geomorphology/Geology

Four major groups of geomorphic processes have had significant influence on the evolution of the Seal River. In order of their historical occurrence, these are glaciation, marine inundation, crustal rebound and fluvial processes. These are all important earth processes and relate directly to C.H.R.S. criteria. While all these processes are inter-related to some extent, they may be better understood by examining them separately.

The processes of pleistocene glaciation has produced several significant landforms along the Seal River, and has had the single most profound effect on the Seal River environment. Most prominent are the several eskers which traverse the river at several points along its course. Eskers are important for a number of reasons. As landscape features, eskers are prominent and may stretch for hundreds of kilometers. Because of their shape and length, eskers have been areas of relatively high activity in the past, by both humans and fauna. Eskers served as campsites, look-out sites and animal and human highways. Abrupt changes in vegetation are also associated with eskers. This is because the drastic change in substrate composition,

exposure and drainage tends to support different plant communities and species than the adjacent lower lands. Typical tree species found on the crests and leeward sides include jack pine, white spruce and poplar. Finally, eskers are the most recognizable and representative products of glaciation.

The processes of glaciation have also produced striking and unique bedrock features. Two crag-and-tail hills have been formed through glacial action (Sites 2 and 20). These hills consist of boulders and rocks of Precambrian age which have been piled up through glacial action, often in the form of drumlins or symmetrical hill shapes.

Glacial transport has been responsible for one of the more distinctive characteristics of the Seal River environment. Huge boulder fields, known as felsenmeer, lie exposed along several areas closer to Hudson Bay. Many of the rapids are the result of the river flowing over a stone field.

One of Manitoba's largest drumlin fields is located at the east end of Shethanei Lake. Drumlins are produced by an ice sheet overriding and reshaping a blanket of till left by an earlier glacial advance. Along the Seal River the drumlin field consists of long, parallel islands and hills with intermittent lakes and ponds.

Marine inundation, a process directly related to crustal depression, has also had a significant effect on the landscape of the Seal River. At one stage in the geological history of the area, Hudson Bay inundated a much greater area than it does presently. The Tyrrell Sea, as it is known in its prehistoric sense, reached its maximum extent inland 7,000 to 8,000 years ago. After this time, the Tyrrell Sea began receding to its present location as Hudson Bay. This occurred when glacial ice melted and the depressed land rebounded when the weight of the mass of ice was removed.

The transgression and regression of the ancient Tyrrell Sea is evidenced in the study area by the distribution of fossilliferous marine clays and wave-modified landforms. A succession of abandoned beach ridges or strands, which generally parallel the present water line of Hudson Bay, extend seaward from the furthest point of inundation. These beaches are a result of deposition which occurred during the regression of the Tyrrell Sea.

In addition to prehistoric processes, the Seal River area is also experiencing significant ongoing geomorphological processes. The most profound of the processes which have shaped the Seal River landscape is crustal rebound, which is still occurring throughout most of the Hudson Bay area. Crustal rebound is occurring as a result of isostatic adjustment of land in response to the melting of the glaciers. The accumulation of an ice sheet in the Hudson Bay area originally depressed the earth's crust as much as one-third of the ice thickness. The unloading is resulting in the uplift of the depressed land toward the pre-glacial state of isostatic equilibrium.

Crustal rebound processes have been taking place along the west coast of Hudson Bay since about 7,000 years ago, at which point the Pleistocene ice age ended. Present calculations of uplift indicate that the land is rising at a rate of 53 centimeters per century (Simpson, 1972). In any geological time frame this is an extremely active and significant process.

Crustal rebound has manifested itself in the Seal River area in several ways. The most obvious effect on the landscape has occurred in and around the estuary of the river. The elevation of the surface of the earth has resulted in a wide, shallow estuary with little evidence of channelling. The process is also creating a poorly-defined, undeveloped river channel with several sets of rapids. This is because the river is constantly being forced to cut new channels as the land rises and the base level falls. Normally, under conditions of a stable land surface, rivers will form well-defined

channels as they reach base level near the ocean. Under the conditions of constant uplift, however, the river fails to take on these characteristics of an older river, as it is perpetually rejuvenating itself.

Fluvial action by itself is also a significant, ongoing process which has had a major role in creating distinct features and scapes along the river. Certainly the most noteworthy of these is the monumental pillar of rock which rises vertically mid channel some 30 meters high (Site 16). Here the river has cut two channels around this huge bedrock promontory. The sheer magnitude of this rock and its outstanding aesthetic qualities make it one of the most noteworthy sites on the Seal.

Another significant riverscape created by fluvial action is a gorge carved 20 meters in gneissic granite, located 14 kilometers west of Great Island. This gorge is considered to be a geological anomaly and a unique formation because of its shape and how it was formed. For over a kilometer, the river flows through this gorge in a narrow, deep and straight channel. Geologists have estimated that a gorge in this state of development could not have been formed since post-glacial times. It, therefore, provides an interesting link with a time that has been all but erased during the last ice age, and is representative of a long, uninterrupted period of fluvial erosion.

The processes of fluvial action have also formed another gorge which is found along the south channel of Great Island. This gorge is known to have been formed after or during the last ice age, as evidenced by its shallow riverbed and the presence of an esker along the south bank. The walls of the gorge, comprised of shale, slate and carbonate, exhibit some spectacular complex fracturing which has occurred as a result of pressure release (exfoliation) in post-glacial times and frost action. The gorge's aesthetic qualities further add to its significance.

A small river delta is located three kilometers upstream on the Big Spruce River, which flows into the Seal just upstream of Great Island. A distinct system of meanders, meander scars and oxbow lakes occurs on an isolated sand plateau which formed as a result of deltaic deposition during the last ice age. Because the substrate is consistent and there is little relief on the plateau, the Big Spruce River has pursued a lazy course, resulting in the network of channels and scars. This delta is highly representative of basic historic and ongoing fluvial processes such as meandering and oxbow lake formation. It is also significant because the river plains are usually associated with wider geographical areas, rather than isolated locations such as this sand plateau.

Both the historical and ongoing processes which have shaped the Seal River area have created a rough, varied terrain with distinctive landforms and unique features. The ongoing evolution of the Seal River environment is especially important because of the intensity of the forces which still today create a dynamic and striking landscape.

Flora

The Seal River area flora provides excellent representation of a state of transition between the forest and tundra life zones. In this environment, the boreal forest takes on a different character than that of southern boreal forests, owing to the limiting effect of the climatic processes. Forest density is extremely low and trees rarely reach heights of more than five to six meters, even though they may be over 200 years of age at these heights. As one travels eastward, further downstream, the forest gives way to areas of treeless heath with tundra-form vegetation. The cooling effect of Hudson Bay gradually begins to limit the productivity of these areas to such a degree that tree growth cannot be sustained. Tundra vegetation is first sited in Segment 4, and true uninterrupted tundra species occur within a few kilometers of Hudson Bay.

Eskers have a significant influence on plant growth. Vegetation which prefer drier areas, such as jack pine, white spruce, poplar, birch and juniper, are often located on the tops of eskers or in the dry blow-out fields. Tundra species, such as Ledum decumbens, will also occur prematurely on the more exposed areas, since the colder micro-climate will not support forest growth.

Climatic processes, mainly through the influence of Hudson Bay, have limited plant growth and created a distinct vegetation zone. The flora of the Seal River area represents the zone which is often referred to on maps only as the "tree line". In fact, the modified boreal forest can be considered to belong to a life zone of its own, since it has adapted to the colder climate and bears little resemblance to the true boreal forest to the south. Herein lies its real value as representation of a true life zone.

Fauna

The harsh environment of the transitional forest does not support high populations of animal species and communities. As noted earlier, animals which live in this life zone tend to be migratory, because there may not be enough food around during certain times of the year. This holds true for the smallest songbird to the largest carnivore.

Accordingly, the transitional forest contains the least number of truly characteristic, or permanent, species of any life zone in Manitoba. As a result, many of the resident species leave the area during winter. The study area, therefore, is an outstanding representation of one of the most significant biological processes — migration. Noteworthy migratory species include the seal, the polar bear and most avifauna. These species are discussed in detail below.

Despite the low carrying capacity of the land, the Seal River area contains some critical habitat areas and is home for a number of rare and endangered animal species. The following is a description of the significant animal species and their habitats.

The Seal River estuary is recognized internationally as an important habitat for the beluga whale. The beluga is a dolphin-like white whale of the species Delphinapterus leucas although there are probably many local stocks and races. Its closest relative is the narwhal, yet they are similar to dolphins in that they have a highly developed social behaviour and means of communication. The beluga has earned the nickname "canary of the sea" because of the wide variety of high-pitched squeaks and squeals it makes, many of which are audible to the human ear above water. It is believed that these sounds are used as sonar for detecting food and avoiding obstacles.

Very little is known about the beluga. It is distributed throughout much of Canada's northern waters, with the highest concentration occurring in river estuaries such as the Seal, Knife and Churchill Rivers. Up to 3,000 whales have been counted at one time in each of these estuaries, with the Seal River estuary probably having the highest concentration. The beluga is thought to concentrate in these river estuaries for several reasons, including an abundance of food, warmer water temperature and the presence of smooth rocks on which they rub off their old skin layer.

The frequency of beluga reproduction is uncertain, but it is estimated that one calf is born every two to three years in June, after a gestation period of 13 to 14 months. Females with calves travel in small groups, while pods as big as 300 whales are not uncommon. Whale movements between estuaries and throughout the north are a mystery, and efforts to monitor population movements have been hampered by unsuccessful tagging methods. Because of the extremely high concentration of whales in the Seal estuary, research efforts have been focussed in this area.

A population of harbour seals regularly occurs a considerable distance upstream on the Seal River. These seals are noteworthy in that they are normally marine inhabitants. Their utilization of the freshwater river environment is an interesting departure from their normal distribution, and is an interesting natural phenomenon. It is for these reasons that the Seal River is so named.

Harbour seals are one of the most widely distributed of seals, occurring throughout much of the Arctic and Greenland, as well as down the east and west coasts of North America. Their diet consists mostly of fish. The undisturbed and concentrated population of fish on the Seal River provides reliable food supply for the many seals which have been spotted as far inland as Tadoule Lake. Since the seals return to Hudson Bay for the winter, this entails a round trip journey of over 350 kilometers which must be accomplished during the short summer season. One unconfirmed report stated that a seal was spotted on Tadoule Lake just before winter freeze-up, which would suggest that some seals overwinter on the river system.

Little is known about the freshwater seal phenomenon. Harbour seals have been known to inhabitat the other northern rivers such as the Thlewiaza in the Northwest Territories, although they are thought to occur in far less numbers than on the Seal River. While the seals are not endangered, they deserve recognition for their adaptation to a new environment and as a unique wildlife viewing opportunity.

Polar bears are a common sight along the coastal area of the Seal River, but are recognized as an endangered species. They are solitary creatures, and are the most carnivorous of the large mammals of the north.

It has been suggested that they are the only animal that will stalk and kill a man. This may be true, but the fact is that man is the polar bear's only enemy.

The polar bear's annual cycle is an interesting and seemingly haphazard one. They are carried southwards in Hudson Bay on drifting ice flows in spring and early summer. When the ice breaks up in August, they come ashore in southern Hudson Bay and make their way up the coast. During summer months, polar bears are regularly sighted around the Seal River estuary, with as many as 50 sightings occurring in some years. Bears have also been sighted up to 70 kilometers inland, although they tend to stay close to Hudson Bay. Shoreline carrion, fish, mussels, crabs, starfish, eggs, plant food and nesting young of waterfowl make up their diet during this time. When Hudson Bay freezes up in the fall, the male bears move out onto the ice where they hunt seals until the following spring when the drifting ice once again carries them to southern Hudson Bay. Female bears excavate dens during the late fall and give birth to an average of two cubs. Cubs den with their mother the first winter and stay with her until next summer.

At one time, thousands of barren-ground caribou occupied the Seal River area. These caribou belonged to the Kaminuriak herd which was centered around Baker Lake in the Keewatin area of the Northwest Territories. Up until 1970, the herd would range south well into and beyond the Seal River area during the winter. In summer, they would migrate back to the tundra. Quite suddenly, however, the herd failed to extend into the transitional forests. Over-hunting, tagging disturbances, forest fires and a host of other factors have been attributed to the herd's change in range. In fact, no one knows for sure why the range has shifted.

In the meantime, people in native communities such as Tadoule Lake have had to adjust to a life without the traditional caribou resource. They used caribou for food, clothing, tools and handicrafts. As a consequence of the changes in caribou migration these people have been forced to substitute the resource or do without.

All management attempts have failed to strengthen the herd's numbers and increase its range. Wildlife biologists have stated that the dwindling caribou population is the most serious wildlife problem in Canada.

The Seal River area provides important habitat for at least three species of endangered birds. These include golden and bald eagles and the osprey. One active bald eagle's nest was discovered about three kilometers downstream of Shethanei Lake.

The occurrence of a colony of cliff swallows at Site 16 on the northern limit of their range is significant since these birds are highly susceptible during periods of inclement weather. They also provide excellent viewing opportunities, and add to the attractiveness of this phenomenal site.

The estuary also provides opportunities for viewing sandhill cranes, arctic terns and a wide variety of other birds and waterfowl which congregate in the food-rich environment of the marine freshwater interface.

It has been demonstrated, therefore, that the Seal River is of particular value for its natural heritage resources, according to C.H.R.S. guidelines. The geology, terrain and landforms of the area are highly representative of the prehistoric processes and stages, such as glaciation and marine inundation, which shaped the transitional forest environment. Ongoing natural processes such as crustal rebound have had, and are having, an equally significant effect on the study area.

The study area is important habitat for a number of unique, rare, endangered and important wildlife species, and provides good representation of biological processes such as migration.

3.4 Human Resource Values

The Seal River has been the focus of significant human activity in its history. The prehistory and recent history of the area are examined below.

Prehistory

Only one archaeological investigation has been carried out specifically on the Seal River (Nash, 1975). Several sites were excavated on Shethanei Lake, mostly on or near eskers. Eskers were areas of high activity because of their suitability for camping and travel. Twelve prehistoric and historic sites were found. Most of the artifacts consisted of small quartz flake clusters which are the remains of tool-making sites. Other artifacts include arrowheads, axeheads, hide scrapers and various cutting tools, the oldest of which is about 700 years old, however, the area was probably occupied as far back as 7,000 years ago.

In this study, surface investigations were carried out on several eskers, beaches and areas likely to have been areas of activity. Hundreds of artifacts, mostly chips and flakes, were found, all of great antiquity and significance. Most often they were located very close to the water and fully exposed. The most common stone material used was crystal quartz and only two chert tools were found. From these preliminary investigations it can be concluded that the Seal River had a high level of human activity before European contact.

These indigenous people are noteworthy for a number of reasons. First, groups of these people moved into the area as long as 7,000 years ago, when the last ice age ended and the ice retreated. They had evolved a low level of technology and spent most of their time engaging in subsistence activities. Because their main food supply, the caribou, was unreliable in its range, considerable energy was spent in tracking and following the migrating herds. In the harsh and unproductive environment, starvation was a constant threat to

survival. Because of the possible age of these remains and because they represent the subsistence cultures which struggles to live in the transitional forest, the artifacts discovered along the Seal are significant and warrant further attention.

Recent History

Despite its remoteness, the Seal River is associated with a remarkable achievement in Canadian history. In 1770, Samuel Hearne, the "Marco Polo of the Barrenlands", set out on foot from the Fort Prince of Wales near Churchill to locate a major copper outcrop which the Indians believed existed by the Northern Ocean. In all, he made three attempts to discover these copper mines. In the course of searching for them, he kept detailed journals which were used in northern exploration for years afterwards, all the while enduring hardship which no ordinary man could survive.

Commissioned by the Hudson Bay Company, Hearne set out on his first attempt with several local Chipewyan guides who had little idea where the mines were. The best information they had was that the mines existed by a river which flowed northwest into the Northern (Arctic) Ocean. After wandering around present-day northern Manitoba and the Northwest Territories for several weeks, during which time several guides deserted and starvation was ever-present, Hearne returned to the fort in December with nothing to show for his efforts.

The following February Hearne was re-outfitted and he set out on his way again. On this journey, Hearne followed the course of the Seal River right up to Shethanei Lake. Here they camped for several weeks at the narrowest point of the lake called "Shee-than-nee" which translates as "high hill" or "hill which rolls into the water". Poor fishing and hunting forced Hearne to move further upstream on the lake. Hearne notes in his journals that the place where they then camped was in view of high hills and next to an

area of open water (Hearne, 1775). His campsite was probably, therefore, near the inflows of the North or South Seal Rivers (Site 1), both of which are in view of the highest point around, as well as near a wide body of Shethanei Lake which never freezes. After restocking their food supplies with caribou and fish, Hearne and his 12 guides then backtracked down the Seal River until he reached the Wolverine River, at which point he turned north and entered the barrenlands. Once again, Hearne was faced with starvation, deserting guides and misinformation. The final straw occurred when his astrolabe blew over and broke. Since he then had no way of recording his latitude and longitude and thus the location of the copper mines, Hearne was forced to abandon his journey and returned to the fort after eight months.

Hearne finally reached the copper mines on his third trip through the forest and the tundra, where he witnessed the Chipewyan slaughter of dozens of sleeping Eskimos.

In the process of searching for these mines, Hearne explored huge tracts of previously untravelled expanses of the transitional forest and barrengrounds, and he was the first white man to see the Arctic Ocean. Much of the area he covered remained untravelled by white man for half a century, and it was as late as 1911 before the barrengrounds were accurately mapped. Up to this point, Hearne's maps and journals remained one of the few sources of information about the vast areas of Canada's north. His extensive journals were a major contribution to the knowledge of Canada's north and provide a fascinating look into the history of the area.

There is also evidence of more recent human activity along the Seal River. Even with the influx of white man's technology in the form of outboard engines, guns, float planes, etc., the Chipewyans maintained an interesting culture which consisted of a balance between their traditional culture and that of the white man. The result was a curious existence that was based on the traditional caribou resource for food and shelter, yet also relied on the white man's technology.

These people were, therefore, nomadic and were still quite isolated from the outside. Today, these small bands of hunters and fishermen have concentrated their activities into larger settlements such as Tadoule Lake.

Several old graves, usually found on top of eskers and marked by old picket-fences, are a testament to these years when the Chipewyan lived their existence with minimal influence form the white man's culture. The bundles of birch bark have been discovered at Shethanei Lake represent an era when the Chipewyans would come from miles around to build birch bark canoes because of the abundance of trees here. These bundles are estimated to be about 50 years old.

The human heritage values of the Seal River are most noteable in terms of the antiquity of the prehistoric artifacts and archaeological sites. The river's association with the remarkable exploration of Canada's barrenland, however, is also of interest, although its relationship to the study area, specifically, is only marginal.

3.5 Recreational Resource Values

The Seal has been presented as a remote wilderness river with limited access. Suitable forms of recreation have to conform to these opportunities and limitations. Its most outstanding recreational opportunity is wilderness canoeing. A several week trip on the Seal River provides tremendous opportunities for natural and human heritage appreciation. The rare opportunity to experience the passage from one life zone into another gives the Seal River wilderness trip a special significance.

Even the expert canoeist will be challenged by this river. Numerous rapids, ledges, shallows and submerged boulder fields must be dealt with constantly. This entails scouting the rapids to plan a suitable course or portaging, often over a rocky shoreline covered in

thick willows. The majority of the rapids are classed at the two to three level of difficulty, so they may be shot fairly safely by experienced canoeists.

The use of rubber rafts with outboard engines is better suited to the less experienced whitewater boater, as the danger of tipping or swamping is virtually eliminated. Almost all the rapids along the river may be shot with a rubber raft. At lower water levels, however, it is conceivable that there may be some extemely difficult portions of the river to navigate and the raft and contents may have to be portaged.

Motorized rafting obviously provides a significantly different type of wilderness experience and caters to a different type of outdoorsman. Compared to canoeing, rafting permits the individual to carry a large load and the rafter can accommodate himself in relative comfort. Nor does it demand the strenuous portaging of canoeing. For the same reason, it does not contribute to the quality of the experience that the canoeist enjoys. P. G. Downes, writing about his canoe travels in northern Manitoba, said, "to crucify one's self a bit on the portage is a salutary thing" (Downes, 1946).

Depending on the depth of the experience desired, the recreationist may choose the canoe or raft. It should be noted that an outboard motor will reduce opportunities to see wildlife, especially the whales at the mouth, which cannot be approached with a motor running. This is significant because boaters must leave the estuary at high tide, travel seven kilometers north along the coast and dock at the whale research camp all before the tide goes out. Whale watching must be carefully timed as a result. The alternative is to disregard the need to land at high tide and to carry the boat and gear across three-quarters of a kilometer of boulder strewn, treacherous mudflats or to arrange to travel directly from the mouth across the bay to Churchill.

The Seal would also be excellent for kayaking, and could be managed easily in either high water or low water conditions. During low water years, kayaking is probably the best method of travelling the river, as there are long stretches where the water depth may be less than half a meter. At lower depths, motorized canoes and rafts must be waded or lined, which can be a very demanding chore on the Seal.

3.5.1 Other Recreation Activities

There are many other recreational activities associated with river travel. Camping, hiking, angling, landscape and wildlife viewing, photography, and a number of other pursuits are all possible. These activities are all strongly related to the wilderness theme. In this context, the wild state of the Seal River and its northern location provide for unsurpassed wilderness recreation opportunities. Travel on the river requires careful planning because of its location and the nature of its environment. The main recreational activities and considerations of travel are described below.

Camping

For the first two-thirds of the journey from Shethanei Lake excellent campsites are readily available. Most of these sites have good docking beaches, shelter from the wind and good fishing nearby. All sites currently being used are in excellent condition. Once the river flows into the forest-tundra zone closer to Hudson Bay, well-drained campsites with good docking points become scarce. The recreationist may find the only alternative is to camp on the wet, willow-infested banks of the river, as much of the inland area is bog. An overnight stay on the estuary can be uncomfortable and potentially dangerous due to the presence of polar bears.

Hiking

Hiking is a must for anybody travelling the Seal River. Even a short trek into the backshore will reveal animal sign and interesting landscapes and plant life. At the other extreme, eskers provide lengthy hikes with a multitude of activities and opportunities for environmental appreciation. Many travellers will want to spend a day or more at some of the most prominent eskers. Beaches are also areas of concentrations of wildlife and human activity, and they make excellent quick stops. Hiking is an excellent way to discover and appreciate the resources and features which make the Seal River a unique wilderness experience.

Angling

Some of northern Manitoba's best fishing is found along the Seal River. At Shethanei Lake, trophy-size lake trout, northern pike and grayling are easily caught. The recreationist can always rely on a meal of grayling along most of the river, especially at rapids. Once downstream of Great Island, fishing success noticeably drops off, although grayling can be taken at rapids right up to the estuary, by line or by fly.

Landscape Viewing/Aesthetics

Overall, the level of diversity, harmony and contrast along the river is moderate. The transition from forest to tundra is a noteable exception to this, however. Eskers, peat plateaus, felsenmeer, beaches and other features also add to the diversity and contrast. Although these features were described earlier, a brief recap is warranted.

a) Eskers: These landforms are an abrupt contrast to the colour and relief of the adjacent land. Eskers also provide the highest points for viewing the surrounding landscape. Eskers on Shethanei Lake will permit the

viewer to see a good portion of the lake and river, including the inflows of the North and South Seal Rivers. The Lavallee Channel esker permits a breath-taking view of the rise of Great Island. Several other eskers and their erosion blow-out fields and beaches are in striking contrast to the otherwise constant forest.

b) Tundra Landforms: Closer to Hudson Bay, the number of unforested peat veneers and thermokarst lakes and ponds increases. These open areas are a contrast to the forest and they signal the change in climate towards Hudson Bay.

c) Beaches: These are found along numerous stretches of the river. Some beaches are more than one kilometer long. Beaches are also good spots for wildlife viewing, as there is always an abundance of tracks and other signs.

d) Great Island: This structure rises gradually, some 100 meters above the river and 275 meters above sea level. It is first visible about five kilometers upstream, where it appears in an impressive panoramic view.

e) Gorges: The Great Island gorge and the pre-glacial gorge are exciting changes from the gradually sloping, willow-rimmed banks. The gray-blue fractured shale along the Great Island gorge is an impressive sight. The piles of fractured rock at the base of the cliffs illustrate the active weathering action on the cliff faces.

f) Bedrock promontory: The structure's sheer size, roaring rapids and birdlife provides an exceptional viewing experience.

g) Felsenmeer: The several stone fields visible along the river give a moonscape quality to these areas. The unsorted, huge boulders appear quite bleak and desolate.

h) Deaf Rapids: The abrupt 8 meter drop as the river enters the estuary creates a powerful scene. The standing waves over two meters high, boiling water and ledge drop-offs are easily viewed from the banks. Because the channel is narrow, short and straight, the drop in elevation is quite apparent and is a fascinating scene, especially if viewed from the base of the rapids in a boat. At this point, the effect of the drop in elevation creates what appears to be a hill of water. Probably because of the sudden drop in elevation, these formidable rapids are barely audible on approach.

i) Estuary: At the end of Deaf Rapids an abrupt change from river channel to wide marine flats occurs. Here, the scene is a wide, open expanse of rocks, huge boulders, shelves and a labyrinth of river channels. Beluga whales are visible in the tidal zone and a host of marine birds nest and inhabit the estuary, including a tern colony.

Wildlife Viewing

There is a high potential to view unique forms of wildlife along the river. One of the more prominent species is the harbour seal. These seals are intensely curious about humans and will often come right up to the boat or shore to satisfy their curiosity. Seals are quite common from Shethanei Lake to the estuary.

The concentration of beluga whales in the estuary is an outstanding opportunity to view this fascinating and mysterious species. Literally thousands converge in the shallows and around the estuary. The sight of these graceful creatures swimming and breaking is a trip highlight.

The endangered polar bear is a common site near Hudson Bay. Opportunities to view and photograph bears must be taken with extreme caution to avoid unwanted encounters.

Moose, black bears, wolves, geese and a variety of birds and waterfowl inhabit the Seal River area in, for the most part, undisturbed populations, providing many good opportunities for viewing and appreciation. If one is travelling by canoe or kayak, it is expected that several wildlife sightings will occur. Cliff swallows are visible at the bedrock promontory and sandhill cranes and a tern colony may be viewed at the estuary.

Human Heritage Appreciation

Prehistoric Indian archaeological sites, sites associated with Hearne's exploration of the region, the more recent mining exploration camp on the east end of Great Island and the trappers' cabins are fascinating heritage resources. These sites are extremely interesting and provide an emotional and contemplative experience. Such resources, however, are very susceptible to disturbances. Many of the tools and equipment left at the exploration camp could easily disappear into the packs of thoughtless travellers. If there is a much higher frequency of use on the river, archaeological artifacts will likely be collected as souvenirs by those who are unconcerned with the educational or legal ramifications of "pot hunting". It must be emphasized to both outfitters and river travellers that the main ethic of any wilderness experience is to leave the environment unscathed and in its natural state. This ethic is of paramount importance on the Seal River because of the numerous sensitive archaeological sites.

Photography

The opportunities to photograph land, water, wildlife and rare botanical specimens in a wilderness area of Canada's north are too numerous to mention. The potential for capturing many unique scenes have been described previously.

Rock Hounding

Even the recreationist who has little knowledge of geology should be interested by the variety and colours of the rocks all along the river. There are a good number of significant rock outcrops along the route, most of which are easily accessible.

3.5.2 Travel Considerations

River difficulty and remoteness demand that considerable planning goes into a trip down the Seal. The potential for serious injury, capsizing and uncomfortable conditions require that visitors be in good physical condition and have a high degree of skill, or be in the care of qualified outfitters. The following are the considerations which must be taken into account when planning a trip.

Access

Access to any starting point on the Seal River is by airplane only. The native settlement at Tadoule Lake is a good starting point. A summer landing strip accommodates regular flights, and a post office, nursing station and grocery store are available. The announcement in January 1986 of a proposed all-weather, paved airstrip and terminal will have a significant effect on access into the area. There is no outfitting service available at Tadoule Lake, however, there are several operators in Churchill and Lynn Lake who outfit boaters and arrange flights into and out of the river.

If a group is outfitted from these communities, there are several logical starting points for a trip down the Seal. Shethanei Lake is a good starting point, or for those wanting shorter trips, the east or west ends of Great Island offer potential landing areas and good campsites. From these points, the trip would be greatly shortened by 30% to 40% but still maintain some of the highlights. At the other extreme, for those wanting longer trips, there are several good starting points along the North and South Seal Rivers, each adding about 200 kilometers to the total trip distance.

At the take-out points at the end of the trip there are also several options. Motorized rafts can make the journey from the estuary to Churchill, a distance of 50 kilometers. One must have advance information about conditions and have a careful eye for the weather and ice conditions. Canoes and kayaks cannot safely make this journey due to the expanse of open water and treacherous shoreline. Some do make the crossing, but it is not recommended. The other alternative is to strike north from the estuary for seven kilometers and fly out to Churchill from the beluga whale research camp. Chartered aircraft can land on wheels or floats at the whale camp. There are at least two operators who fly out of the whale camp on an intermittent basis while the facility is in use. Travellers cannot expect to use the accommodation at the whale camp overnight as this is not a public facility, however, it is possible to tent in the vicinity.

Services and Support Facilities

The towns of Churchill and Lynn Lake are the two centers supplied with support facilities to outfit and accommodate recreationists who are inbound or staying over for a night after the completion of their trip.

Potential exists for developing a base of operation at the Village of Tadoule Lake. Presently, however, there are few services which the town can provide which would be of use to the recreationist, except for a landing strip.

Water Conditions

Water levels on the Seal River may vary significantly from year to year. The variation in water levels can make drastic changes in the rapids and the navigability of shallower areas. For these reasons, it is impossible to recommend the safest routes through the rapids. Each boater must scout and evaluate the best route or, alternatively, determine whether or not to portage the rapids. Portage paths are usually non-existent. The possibility of capsizing, either in a canoe, kayak or rubber raft, is very real.

If one is travelling by motorized raft with the added weight, it is especially important to get some advance information on the water levels for that year. Low water levels could make parts of the river impassable for a raft with a heavy load or gear, several passengers and a large motor, or even a light canoe. In many places, the river spreads out as much as a kilometer wide over boulder fields with the water no more than one-half meter deep. During field investigations, water levels two kilometers downstream of Great Island were 121.458 meters above sea level (July 15, 1985). At this level there are six sets of class one rapids, 17 class two, eight class three, ten class four, two class five and one class one set, rated according to the International Whitewater Rating Scale. The July 1985 water level is slightly below the previous ten year average of 121.732 meters above sea level.

Once at the estuary, it is desirable to shoot or portage the final set of rapids at high tide, or just before. The estuary itself, beyond Deaf Rapids, consists of a maze of rapids, shoals and ledges and at least one hour must be set aside to navigate through to Hudson

Bay. Once below Deaf Rapids, the estuary is probably not navigable at low tide. Therefore, it is important to obtain a tide chart for the mouth of the Seal River.

Hazards of the River

a) The most obvious natural hazard is the character of the rapids and falls on the river. This, of course, is part of the recreational experience and it is assumed that any user will use good judgement as to how to approach them.

b) There is a probability of encountering polar bears at the mouth of the Seal River. If a bear is sighted, the best plan is to keep on the river and maintain a considerable downstream wind distance between your camp and the bear. It is also important to ensure that food is cached overnight away from canoes or rafts.

c) The dynamite and blasting caps still found in the mining camp are a potential hazard that should be removed immediately.

d) Travel in the estuary can be dangerous and requires extreme caution. It is important to know what the tide levels are. This area can only be safely travelled at high tide. Leaving the river at low tide can pose unnecessary problems. Tidal charts are available in Churchill from government agencies.

e) The last hazard is the bay itself. Ice, prevailing northwesterly winds and unpredictable weather require extreme caution. One should only boat out onto the bay when it is certain that the weather conditions, ice

conditions, wind conditions and air temperature are acceptable to the state of preparation and the kind of craft which is being used.

In light of these hazards, portable radios may be of help. The signal must reach, at the minimum distance, Tadoule Lake, Churchill or Thompson, and the radio signal power used should be more than enough to reach these contacts. Recreationists should not, however, depend on such equipment. Local relief, weather conditions and other factors may impede signals.

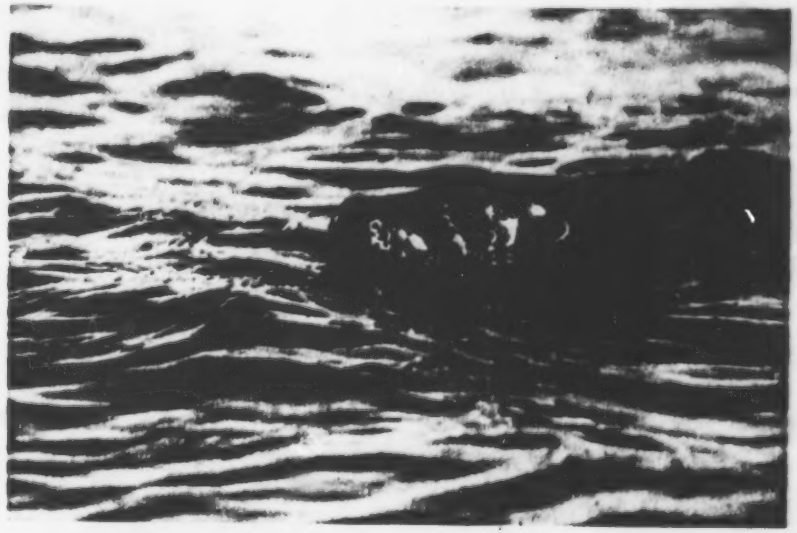
The Seal is a demanding river and is suitable for experienced river travellers who seek the northern wilderness adventure. The occurrence of several significant landforms, riverscapes and wildlife species in such a concentrated area is surpassed by few other northern rivers. The unique opportunity to view the change of one life zone while experiencing the limiting conditions which cause its transition, all within a relatively short distance, gives the Seal River a special recreational quality. The sensitivity of its resources to over use, however, cannot be over-emphasized. Increased use and pressures on the biota and on unstable landforms could permanently damage the resources which make the Seal a prime wilderness river. This raises questions regarding the capability of the area to sustain recreational use. A discussion of these management concerns is presented in Section 6.0.

The natural, human and recreational heritage resources of the Seal River have been presented in a general overview, segment and site descriptions and an accounting of the significance of the resources in relation to C.H.R.S. guidelines. In the following section, the evaluation of these resources are summarized with direct reference to C.H.R.S. guidelines.

9. Tern Chick (Segment 5)

10. Arctic Grayling (Site 13)

11. Beluga Whale Pod at Estuary (Site 31)



12. Harbour Seal (Site 15)

4.0 RESOURCE EVALUATION

This section presents an evaluation of the Seal River's heritage according to the specified guidelines of the C.H.R.S. There are five categories of guidelines respect natural heritage values, human heritage values and recreational values, and river integrity and management suitability.

The degree to which the river meets the guidelines for natural and human heritage and recreational values is rated on a scale ranging from very high to low. Of the 10 guidelines in these categories, the Seal is rated very high for one, and high for five of the guidelines. One guideline is rated moderate and three are low. A summary statement accompanies each guideline.

Summary statements are also provided for evaluation of the remaining guideline categories for river integrity and management suitability. Overall, the Seal River well meets the guidelines of the C.H.R.S.

4.1 Natural Heritage Values

Guideline: "The river is an outstanding example of river environments as they are affected by the major stages and processes in the earth's evolutionary history which are represented in Canada."

High: The river environment is an excellent representation of an area undergoing isostatic adjustment (glacial rebound) as illustrated by the course channel, especially near Hudson Bay. The processes of glaciation are also well represented. Other examples of river environments as they are affected by major stages and processes are limited.

Guideline: "The river is an outstanding representation of significant ongoing fluvial, geomorphological and biological processes."

High: As noted above, the river is an excellent representation of a water course undergoing rejuvenation through isostatic uplift. Ongoing geomorphological processes include permafrost collapse of river banks, bank ice scour, erosion of glacial deposits such as eskers and deltas resulting in scarps, and deposition of eroded material into spits and bars. Examples of ongoing biological processes include polar bear, waterfowl, geese and seal migration. The recent shift in the Kaminuriak caribou herd's range is also an illustration of the dynamics of the herd population and distribution, even though it is not understood.

Guideline: "The river contains along its course unique, rare or outstanding examples of natural phenomena, formations or features, or aesthetic qualities."

High: Unique, rare or outstanding examples include the eskers and associated erosional features such as scarps and blow-out fields, the Great Island bedrock promontory, two gorges, felsenmeer, crag-and-tail hills, the estuary, Big Spruce River delta and 9-bar rapids. The concentration of beluga whales at the estuary and the presence of seals along the river are also outstanding examples of natural phenomena. Features with particular aesthetic appeal include the Great Island bedrock promontory and the numerous eskers.

Guideline: "The river contains along its course, habitats of rare or endangered species of plants and animals."

Moderate: Rare or endangered species include the polar bear, golden and bald eagles and the wolverine.

4.2 Human Heritage Values

Guideline: "The river is of outstanding importance due to its influence over a period of time on the historical development of Canada through its impact upon the region in which it is located or beyond."

Low: The Seal River was not a major transportation route or area of significant human activity in terms of its impact upon the region or beyond.

Guideline: "The river is strongly associated with persons, events, movements, achievements, ideas or beliefs of Canadian significance."

Low: Samuel Hearne travelled the Seal River and over-wintered on Shethanei Lake as he prepared to enter the barrenlands in search of the copper mines. In the course of searches, he traversed huge tracts of unexplored area of Canada's north. His detailed journals provided information on the natives of the north and much of the information from his maps was in use as late as 1900.

Guideline: "The river contains historical or archaeological structures, works or sites which are unique, rare, or of great antiquity."

High: On the basis of preliminary investigations, there appears to be a high concentration of prehistoric artifacts along the Seal River, many of which may be as old as 7,000 years. Additional research and on-site examination is needed to confirm the archaeological significance of these prehistoric resources. Abandoned trappers' cabins and a mining exploration camp with several intact structures are also found along the river. These features are of historical interest.

Guideline: "Consideration should also be given to the state of preservation of the river environment relative to its visual appearance during the historical period in which the river is considered to have been of outstanding importance.

Very High: The river environment remains unchanged from any time in its relevant history.

4.3 Recreational Resource Values

Guideline: "The river possesses a combination of recreational opportunities and related natural values which together provide a capability for an outstanding recreational experience. Recreational opportunities include such activities as boating, hiking, swimming, camping, wildlife viewing and human heritage appreciation. Related natural values include natural visual aesthetics; that is, diversity and quality of scenic beauty and physical essentials such as sufficient flow, navigability, rapids, accessibility and suitable shoreline."

High: The river provides an outstanding wilderness experience. Opportunities for related recreational activities are also outstanding. These include canoeing, boating, camping, wildlife viewing, photography, rock hounding, fishing and hiking. The opportunity for human heritage appreciation is outstanding, owing to the large numbers of artifacts, cabins and the mining exploration camp. Natural visual aesthetics tend to be limited overall, owing mainly to a low level of diversity. Exceptions to this include the change from forest to tundra, the Great Island bedrock promontory, the estuary, gorges, felsenmeer and bedrock hills. Physical essentials for an outstanding recreational experience tend to limit the river's capability. Sufficient flow cannot always be relied on in years of low precipitation, making navigation difficult or impossible. Suitable shoreline for camping becomes scarce in the lower one-third of the river. Access is by float plane only.

Guideline: "The river is capable of supporting recreational uses without significant loss of or impact upon its natural, historical or aesthetic values."

Low: With the current levels of use, there is expected to be little impact upon these values. Increased use without appropriate management would have a significant effect on the river's values and capability, and recreational uses should be managed accordingly.

4.4 Assessment of River Integrity

In addition to the preceding specific guidelines, three conditions of river integrity must be considered in determining the overall suitability of the river for nomination. These integrity guidelines are addressed in the following section.

Guideline: "The river and its environment should be of sufficient size and contain all or most of the key interrelated and interdependent elements to demonstrate the key aspects of the processes, features, activities or other phenomenon which give the river its outstanding value."

The presence and abundance of various resource features and phenomena associated with the river is considered to be important in assessing its integrity. The following outline presents a list of the main features and phenomena; rates their presence/abundance; and denotes activities and opportunities which these features represent.

Process	Feature	Presence (Abundance)	Activity
Crustal Rebound	Immature Channel	High	Nature Appreciation Boating
	Immature Estuary	High	Aesthetics Nature Appreciation
	Rapids	High	Boating Aesthetics

Process	Feature	Presence (Abundance)	Activity
Glaciation	Esker	High	Camping Hiking Aesthetics Nature Appreciation Human Heritage Appreciation
	Crag-and-Tail Bedrock Outcrops	Moderate	Aesthetics
	Felsenmeer	High	Aesthetics Boating
	Drumlin Field	High	Nature Appreciation
	Deltaic Deposits	High	Aesthetics Camping
	Potholes	Low	Nature Appreciation
Fluvial Action	Great Island Bedrock Promontory	Low	Aesthetics
	Ice-scoured Banks	High	Nature Appreciation Aesthetics
	Gorges	Moderate	Aesthetics
	Permafrost Scarps	High	Camping Aesthetics Nature Appreciation
	Delta	Moderate	Aesthetics
	Big Spruce Delta	Low	Nature Appreciation
Climate	Modified Forest	High	Nature Appreciation
	Tundra Vegetation	Moderate	Nature Appreciation
	Peat Polygons	Moderate	Nature Appreciation

Process	Feature	Presence (Abundance)	Activity
Life Processes	Beluga Whale	High	Nature Appreciation
	Seal	High	Nature Appreciation
	Polar Bear	High	Nature Appreciation
	Caribou	Low	Nature Appreciation
	Avifauna	High	Nature Appreciation
	Fish	High	Angling
Prehistoric Native Occupation	Artifacts	High	Human Heritage Appreciation
Historic Native Occupation	Trappers' Cabins	Low	Human Heritage Appreciation
European Exploration	Samuel Hearne's Exploration Route	Moderate	Human Heritage Appreciation

The Seal River has, therefore, been determined to contain all of the elements which demonstrate the key aspects of the processes and activities which give the river its outstanding value. Most of the important processes are well represented by the features and activities.

Guideline: "The river and its environment should contain those ecosystem components required for the continuity of the features or objects to be protected."

The transitional forest ecosystem has remained stable and is expected to remain stable in the foreseeable future. This is because the important ecosystem components have remained, for the most part, unaltered, and they have adapted to the rigours of the northern

environment. Intervention by man in the area is expected to be minimal, which will also ensure that the present level of stability will endure.

One exception is the caribou. An important ecosystem component, the caribou have recently altered their range and only a few herd stragglers range as far south as the Seal River. The specific effects of the absence of caribou on other species' populations, such as wolves, is not known. It can be expected, however, that most populations will remain stable for the most part.

Guideline: "The quality of the water should be such as to provide for the continuity and/or improvement of the resources upon which 'value' to the system has been determined."

There is no existing source of water pollution or other factor that would significantly alter the present high water quality. Furthermore, high water quality seems assured for the future, as there are no developments planned in the area.

4.5 Assessment of Management Suitability

In addition to the 13 specific guidelines, the C.H.R.S. requires an assessment of the management suitability of the river. This requires consideration of two areas -- the long-term suitability of managing the river, and existing legal mechanisms which may be used to implement a management plan. The assessment of long-term suitability requires the identification and assessment of land use and other factors which might influence the future feasibility and costs of managing the river in keeping with the objectives of the C.H.R.S.

With the exception of a few canoe parties and the occasional trapper, human activity in the Seal River area is virtually non-existent. Consequently, present land use is not a factor in future management of the river. The possibility of future hydro-electric

development along the river, however, must be considered. Studies undertaken or commissioned by Manitoba Hydro have found from six to nine sites suitable for dam construction along the river (Diakiw, 1955). The possibility of diverting the Seal River south to Southern Indian Lake to increase the electrical generating potential of the Nelson River was also studied (Underwood et al., 1968). These studies found that the benefits from development along the Seal River were marginal. However, the potential for future development, depending on future demand, cannot be dismissed. Any such developments would severely compromise the feasibility of managing the river in accordance with C.H.R.S. objectives. At present, no developments are planned or foreseen and, therefore, it is not seen as a limiting factor.

The second component of the assessment of management suitability requires the identification and assessment of existing legal mechanisms which could be used for developing and implementing a management plan, or for the long-term management of the river according to C.H.R.S. guidelines.

The Manitoba Parks Branch has proposed the establishment of the Seal River as a Provincial Recreation Waterway Park in its 1985 "Systems Plan for Manitoba's Provincial Parks". This action would bring the Seal River under the management framework of The Provincial Park Lands Act (1972).

Provincial Recreation Waterway Parks are one of several park classifications employed by the Parks Branch. Recreation Waterways are travelways that include rivers chosen for their attractive natural features, historical significance, or exceptional recreational capacity. The system plan states that the Seal River Provincial Waterway would:

- promote the use and protection of Manitoba's last, great wild river;

- protect a beluga whale calving ground at the river's estuary;

- provide on-site and vicarious interpretation of the beluga whales; and

- provide tourism development opportunities associated with canoeing and rafting.

Establishment of this park is called for in phase two of the system plan's implementation schedule. No specific date or time frame is given.

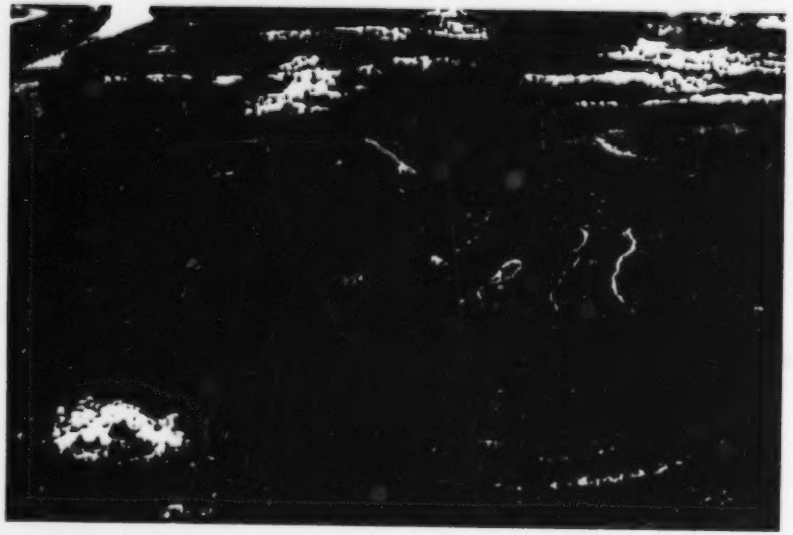
Other legislation which is pertinent to management of the resources include The Historic Sites and Objects Act and The Ecological Reserves Act. This legislation could be employed to protect site specific features along the river.

Evaluation of the Seal River has established that the river displays a high degree of integrity. The key elements which demonstrate the important processes and resources of the river are of sufficient size and quality, and are found in close proximity to the river. Because the area has remained largely untouched and is expected to remain in its wild state, the ecosystem is expected to function in such a way that its species will continue to exist. Present and future expected land use, with the exception of recreation, will have little or no influence on the management of the river. A high degree of integrity is associated with the natural heritage resources and, to a slightly lesser extent, the human heritage resources. Despite the significant and spectacular recreational resources of the river, its integrity is compromised by the lack of physical essentials such as flow, its remoteness, and the difficulty of the course.

The following section presents recommendations pertaining to the Seal River's qualifications as a Canadian Heritage River. This study concludes with the identification of potential management issues and requirements for further research.

13. Mining Exploration Camp (Site 19)

14. Tundra/Forest Transition (Site 21)



15. Big Spruce River Delta (Site 11)

16. Peat Polygons (Segment 4)

5.0 CONCLUSIONS AND RECOMMENDATIONS

It is recommended that the Seal River be nominated for inclusion in the Canadian Heritage Rivers System. The significance of its resources are such that the river warrants recognition as an important river to Canadians. Further, the Seal River meets and surpasses the requirements of a Canadian Heritage River. The opportunity for the designation of a wild and exciting river is clear.

It is recommended that the nomination area consist of the total length of the Seal River from the west end of Shethanei Lake up to, and including, its estuary at Hudson Bay. The nomination area width should consist of the visual corridor, two kilometers on either side, due to the low level of human activity in the area, and the unlikelihood of future development. The area should also include both the north and south channels of Great Island, and the whole of the island. The Big Spruce River, up to and including its delta, should also be included within the nomination area.

The Seal River is most outstanding for its natural heritage resources. All four of the specific guidelines for selection of rivers for their natural heritage values are met. Of particular note are the endangered and unique species and the associated critical habitat, the outstanding representation of past and ongoing natural processes, and the unique life zones through which the river flows.

The Seal River also warrants consideration for its human heritage resources. The prehistoric native cultures thrived in this environment, as evidenced by the wealth of artifacts left behind. The river and its post-contact culture also deserve recognition as being instrumental in the exploration of Canada's north by Samuel Hearne. The white man has had little influence on the area, and sites such as the mining exploration camp and trappers' cabins are testament to the white man's brief contact with the area.

The recreational significance of the Seal River is moderate because of the difficulty of the course, unreliable flows, and limited access. For the determined and experienced recreationist, however, these factors should not detract from the positive recreational resources of the river. The opportunity for a boating adventure in wild and unique setting, and the potential for nature and human heritage appreciation and scenic viewing are unsurpassed for the prepared recreationist.

The Seal River, therefore, has been determined to be of outstanding value to Canadians, in accordance with the C.H.R.S. guidelines and criteria. An excellent opportunity exists to give recognition to and protect an outstanding Canadian river.

5.1 Management and Planning Considerations

Natural Heritage Resources

At present levels of use, there has been no conflict between recreational use and the river's heritage resources. If present use levels increase in the future, there will almost certainly be resource depletion and conflicts. A description of these conflicts and management concerns is presented below.

There are a few places where fire rings are left and, where these occur on eskers, they will no doubt be used by other rafters or canoeists. There are no regulations prohibiting the use of open fires in this remote area. Since campsites are frequently on sandy esker sites, the hazard of forest fire is very low. Forest fires, once started, however, are not fought in this remote area and continue to burn until they are extinguished by natural means. A decision should be made as to whether the enforcement of fire regulations which prohibit the use of open fires at certain times should be extended to this region. Peat plateaus on the lower part of the river create another type of hazard for fire and on that part of the river fire

should be made only on mineral soil. Also, a high frequency of use could create a shortage of firewood on local sites. This potential problem should be monitored. With higher use it may be that the backpack stove is more advisable on a wilderness river.

Plant disturbance is another management concern. In this climate plant growth is very slow. Seriously disturbed plant life will recover only after a very long regeneration time. If campsites are designated along the river on eskers, this is not likely to be a serious problem. Many of these potential campsites have very little vegetative cover as it is. However, in the lower reaches of the river, sandy or mineral soil campsites are non-existent. Frequent use could seriously alter the lichen and moss carpets which cover these areas, as they are highly sensitive plant communities. Designated campsites in these areas should be seriously considered.

Angling is an excellent recreational form, particularly for Arctic grayling west of Great Island. Below Great Island, the frequency of catch was much reduced. The productivity rates of the river for grayling are not known and hence cannot be forecasted in relation to angling pressure. The density of anglers that will sustain a high class grayling sport fishery is, therefore, not known. Grayling populations on similar northern rivers are known to be highly sensitive to angling pressure. It is assumed that the same holds true for the Seal River.

Human Heritage Resources

Assuming that the level of human activity along the Seal River will increase, the most serious issue concerns the multitude of prehistoric artifacts which lie exposed along the river's course. There is a very real possibility that many of these artifacts -- arrowheads, scrapers, chips, etc. -- will disappear into the packs of insensitive travellers who view them as nothing more than souvenirs.

In fact, very little is known about the cultures of the transitional forest, and it is not inconceivable that a significant number of artifacts may be removed, thus making future archaeological investigations inaccurate or difficult. One possible solution to this problem may be to undertake a complete archaeological investigation along the river, before any increase in human activity occurs.

The mining exploration camp and trappers' cabins may also suffer the same fate as the native artifacts. While these structures and their associated artifacts are not as sensitive as the prehistoric remains, they are subject to the same souvenir-hunting pressures. If each party removed one article from these camps, it would only be a matter of a few seasons before these camps are stripped of everything which makes them noteworthy. As unique opportunities for recreationists to appreciate life in the north, this resource must be protected. One possible solution would be to post signs around these sites which remind recreationists of the implication of "pot hunting". To restrict access to these areas would render these sites as non-resources, since their value lies in the opportunity for people to walk in and among the structures and experience them first-hand.

A serious danger exists at the mining exploration camp. Hundreds of deteriorating dynamite sticks and blasting caps lie exposed. These explosives must be removed by the proper authorities in case of accidental explosion. It is recommended that the explosives be removed and destroyed, rather than detonated on site, as this would destroy some of the structures.

Recreation Resources

Another major management issue concerns the opportunity for the establishment of outfitting businesses for recreational travel on the river. Presently, a few operators out of Churchill and Lynn Lake will outfit parties for trips down the Seal River. If levels of recreational use and demand rise, there may be opportunities for

viable outfitting operations to be established for the Seal River. Because the river flows through traditional Chipewyan Indian territory, serious consideration should be given to the possible interests by Tadoule Lake village residents to set up operations. It should be noted that the Tadoule Lake residents would be at a serious competitive disadvantage for starting up such a business in comparison with enterprises in Churchill or Lynn Lake because of isolation and lack of capital and business skills. Assistance in the form of capital and professional advice would have to be provided, most likely through government agencies.

With nomination or designation of the river, a serious responsibility will lie with government agencies to warn or prepare boaters on the dangers of the river. More specifically, the means to limit or preclude the necessity to travel by water to Churchill should be established. At the present time, parties may be flown out from the beluga whale research camp which maintains an airstrip. It is not expected, however, that the camp will remain in operation for much longer. A possible solution would be for the appropriate agencies to maintain the airstrip so that parties can be assured of being flown out.

Because the river is presently experiencing little human activity, there is no need to implement interim management plans between present time and the implementation of a long-term management plan.

5.2 Requirements for Further Research

Several areas of interest exist where there is little or no information available. Further research in these areas would contribute to any future management plan.

The most obvious area concerns the archaeological resources of the Seal River. Field investigations undertaken during this study, although limited to surface investigations, have shown that the Seal River corridor is significant in terms of the level of concentration of prehistoric human activity and the antiquity of the artifacts. Previous studies have been limited to the one site at the Shee-than-nee esker (Nash, 1974). Further investigation should concentrate on any of the identified or potential sites between Shethanei Lake and the east end of Great Island.

The use of the Seal River as habitat for seals warrants research into this interesting and little understood adaptation. Investigation should pertain to the geographical and temporal distribution of the seals, and their utilization of the river in terms of food, reproduction, and predator/prey relationships.

The relationship between water levels and recreation enjoyment on the river must be determined to further assess the river's recreational potential. Research should determine levels at which boating is no longer feasible or enjoyable. Factors such as water depth, transportation method used (canoe, raft or kayak), rapid quality and the desired experience should be addressed.

The announcement in January 1986 of the planned construction of a paved airstrip and terminal at Tadoule Lake will have a major effect on access into the area. The implications that this airport will have for resource use in the area should be determined. Factors such as increased recreational and economic activity should be addressed.

The effects of any potential increases in recreational use on the environment requires further research. Factors such as activity levels, transportation methods used, landscape deterioration in sensitive areas such as eskers, beaches and other campsites, and disturbance of fish and wildlife populations should be determined.

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APPENDIX I

LIST OF SCIENTIFIC NAMES OF SPECIES

Fauna	
Tundra Swan	Olor columbianus
Canada Goose	Branta canadensis
Bufflehead	Bucephala albeola
White-winged Scoter	Melanitta deglandi
Common Merganser	Mergus merganser
Bald Eagle	Haliaectus leucocephalus
Osprey	Pandion haliaetus
Arctic Tern	Sterna paradisaea
Cliff Swallow	Petrochelidon pyrrhonota
Black Duck	Anas rubripes
Golden Eagle	Aquila chrysaetos
Sandhill Crane	Grus canadensis
Northern Pike	Esox lucius
Lake Trout	Salvelinus namaycush
Arctic Grayling	Thymallus arcticus
Whitefish	Coregonus clupeaformis
Speckled Trout	Salvelinus fontinalus
Beluga Whale	Delphinapterus leucas
Barrenground Caribou	Rangifer tarandus
Moose	Alces alces
Black Bear	Ursus americanus
Wolverine	Gulo gulo
Marten	Martes americana
Snowshoe Hare	Lepus americanus
Lynx	Lynx lynx
Wolf	Canis lupus
Beaver	Castor canadensis
Muskrat	Ondatra zibethicus
Otter	Lontra canadensis
Fisher	Martes pennanti
Polar Bear	Ursus arctos
Harbour Seal	Phoca uitulina
Narwhal	Monodon monoceros

Flora	
Black Spruce	*Picea mariana*
White Spruce	*Picea banksiana*
Tamarack	*Larix laracina*
Willow	*Salix sp.*
Jack Pine	*Pinus banksiana*
White Birch	*Betula papyrifera*
Trembling Aspen	*Populus tremuloides*
Balsam Poplar	*P. balsamifera*

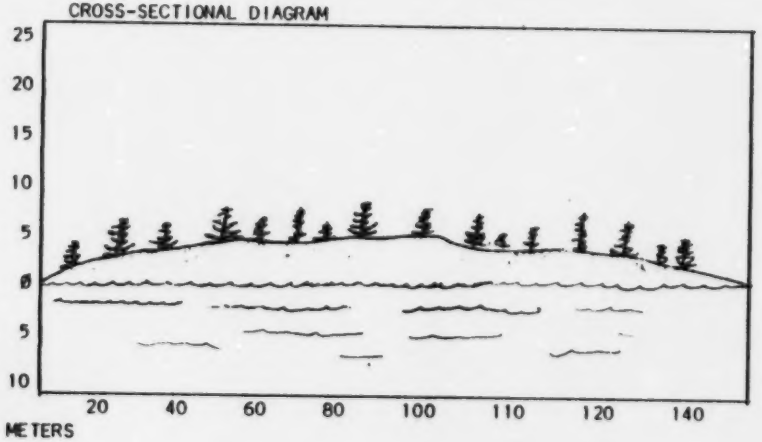
APPENDIX II

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
1		10	09	85	GDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	2	X	2			X	5	X	2	X	2
DIV.	X	2	X	2	X	2	X	5	X	2	X	2	X	2
CTN.	X	2	X	2	X	2			X	3	X	2	X	2
INT.	X	2	X	2	X	2					X	2	X	2
REP.	X	4	X	2	X	2			X	2	X	2	X	2
UNI.	X	2	X	2	X	2			X	5	X	4	X	2
NAT.	X	5	X	5	X	5					X	2	X	2
W.Q.U.	X	5	X	5	X	5								
HAR.							X	3						
CONT.							X	5						
RAR.									X	5				
ANT.									X	5				
CDN.									X	2				
TOT.		24		22		22		13		29		16		14
AVE.		3.0		2.7		2.7		4.3		3.2		2.2		2.0
RTG.		G		F		F		E		G		F		F

CROSS-SECTIONAL DIAGRAM



FLORA: Typical spruce forest.

FAUNA: Not surveyed.

GEOL./GEOM.: Slightly elevated knoll.

AESTHETICS: Excellent view of eskers on north shore of lake.

RECREATION: Limited. Potential for human heritage appreciation.

HUMAN: Hearne's campsite.

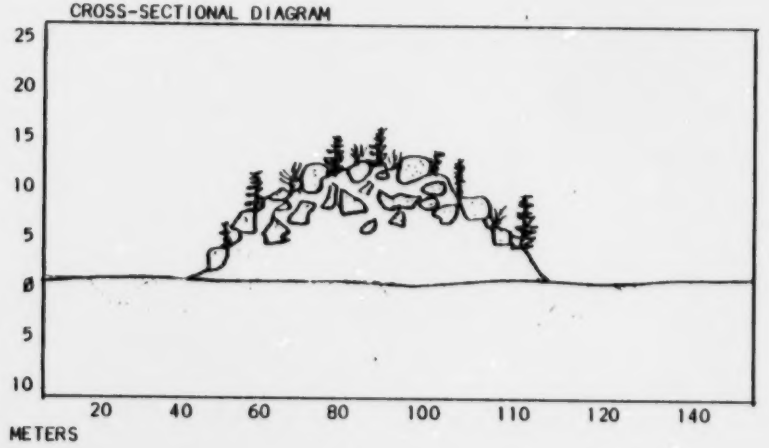
GENERAL COMMENTS: This site may have been the location where Samuel Hearne and his guides camped during the winter of 1771, however, it has yet to be investigated.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
2		10	07	85	GDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	3/4	X	2	X	4			X	1	X	3	X	3
DIV.	X	4	X	2	X	4	X	4	X	1	X	3	X	3
CTN.	X	4	X	2	X	4			X	1	X	3	X	3
INT.	X	3	X	2	X	2					X	3	X	3
REP.	X	4	X	2	X	2			X	1	X	2	X	2
UNI.	X	1	X	1	X	4			X	1	X	3	X	3
NAT.	X	5	X	5	X	5					X	5	X	5
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	5						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		30		21		30		11		8		22		22
AVE.		3.7		2.6		3.7		3.6		1.0		3.1		3.1
RTG.		G		F		G		G		P		G		G

CROSS-SECTIONAL DIAGRAM



FLORA: Spruce, willows, etc. Interesting growth on the stone hill.

FAUNA: Moose scats and bird and bear tracks.

GEOL./GEOM.: Sand beaches with low/moist area in center with drainage channel. Fifty foot rock hill with huge boulders.

AESTHETICS: Excellent view of the lake from the hill. Hill, itself, is impressive.

RECREATION: Excellent camping facilities. Climb to hill top was fascinating. First campsite after Shethanei Rapids.

HUMAN: Two excellent campsites.

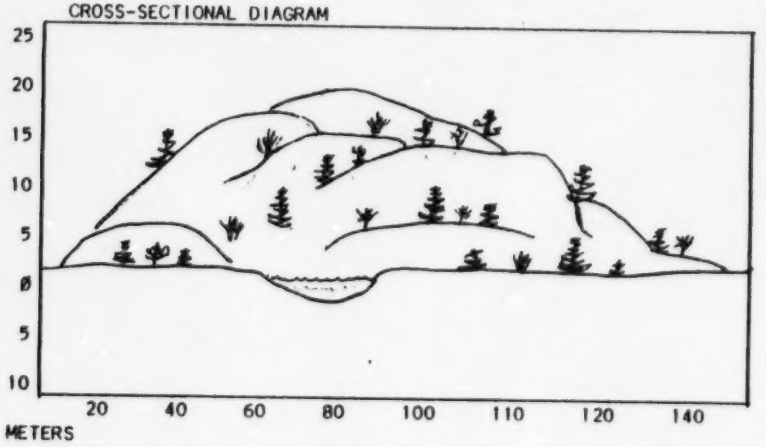
GENERAL COMMENTS: This is a peninsula with two beaches. One of the two will be well sheltered from the wind. Two to three good campsites exist along the western beach. In the center of the peninsula is a lower, moist area with assorted flora. An interesting channel which has cut through the bog, moss and sand gives an interesting glimpse into the strata of the area. To the south, about a three minute walk, is a huge boulder hill with some rocks thirty feet in diameter and precariously balanced. This is a good point for sunset viewing.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
3		10	09	85	GDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	5	X	4	X	4			X	5	X	5	X	5
DIV.	X	4	X	4	X	5	X	5	X	5	X	5	X	5
CTN.	X	5	X	5	X	4			X	5	X	5	X	5
INT.	X	4	X	4	X	4					X	5	X	4
REP.	X	5	X	5	X	5			X	5	X	5	X	5
UNI.	X	5	X	4	X	5			X	5	X	5	X	5
NAT.	X	5	X	5	X	5					X	5	X	5
W.Q.U.	X	4	X	4	X	4								
HAR.							X	5						
CONT.							X	5						
RAR.									X	5				
ANT.									X	5				
CDN.									X	5				
TOT.		37		35		36		15		40		35		34
AVE.		4.6		4.3		4.5		3.0		5.0		5.0		4.8
RTG.		E		E		E		G		0		0		E

CROSS-SECTIONAL DIAGRAM



FLORA: Typical -- moss, willow, spruce and tamarack. Birch bark stand.

FAUNA: Peat moss, wolf (2) tracks and scats. Semi-palmated plover.

GEOL./GEOM.: Beach, rock shore, esker, wide/flat peninsula and kettle lake. Esker is fine and rounded to hummocky and course.

AESTHETICS: Beach, pool, sand ridges and esker all very close. View of highest point across the lake.

RECREATION: Excellent campsites, beaches, views and hiking potential.

HUMAN: Four graves, rolls of birch bark and hundreds of chips, flakes and arrowheads. Clean/recent campsites.

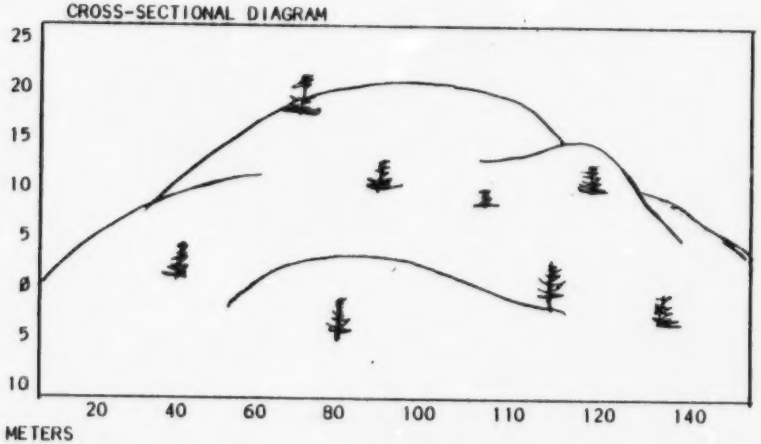
GENERAL COMMENTS: This is one of the most noteworthy sites on Shethanei Lake. It consists of a long beach, an almost park-like peninsula and a miniature kettle lake. An esker extends far back into the bush and affords an excellent opportunity for a look at the interior. The esker itself branches out at points, and is made of course rocks to fine, dune-like sand. At least four graves can be found on the esker, and hundreds of artifacts lie exposed on the beach. Deteriorating rolls of birch bark were found in the park area. Shethanei Lake was used for canoe construction and people would come from miles around. This site may also have been used by Samuel Hearne when he left Shee-than-nee. Camping facilities are excellent and provide an excellent view.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
4		10	07	85	DDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	1	X	4			X	1	X	1	X	2
DIV.	X	3	X	1	X	2	X	4	X	1	X	1	X	2
CTN.	X	2	X	2	X	3			X	1	X	3	X	2
INT.	X	2	X	2	X	1				1	X	2	X	1
REP.	X	4	X	4	X	4			X	1	X	4	X	4
UNI.	X	2	X	1	X	4			X	1	X	4	X	4
NAT.	X	5	X	5	X	5					X	5	X	5
W.Q.U.	X	3	X	3	X	3								
HAR.							X	3						
CONT.							X	4						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		23		19		26		11		9		20		20
AVE.		2.8		2.3		3.2		3.6		1.0		2.8		2.8
RTG.		F		F		G		G		P		F		F

CROSS-SECTIONAL DIAGRAM



FLORA: Spruce, moss, etc. Sparse.

FAUNA: Moose tracks and caribou antler.

GEOL./GEOM.: Sand ridges and very high esker.

AESTHETICS: Affords excellent view of the lake.

RECREATION: Nice to walk but almost impossible to get at.

HUMAN: No sign.

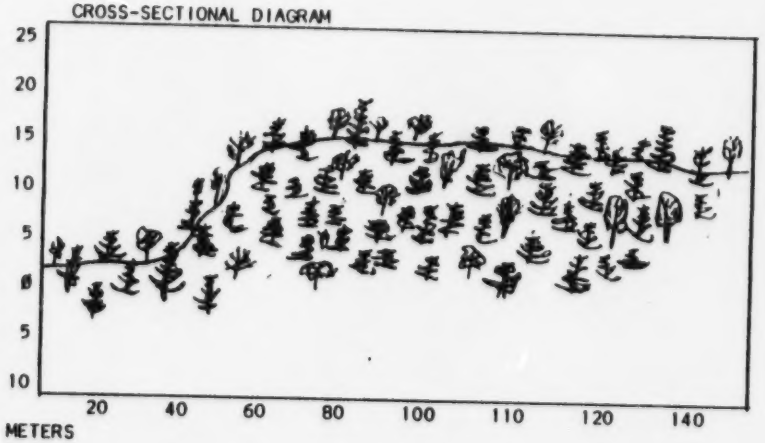
GENERAL COMMENTS: This site is an esker that is probably the highest and most visible point of the lake. It branches, rolls and has several knolls, yet it lacks the classic esker shape as the one immediately to the south has. It is extremely tough to get at.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
5		1 2	0 7	8 5	G D D F A C		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	5	X	4	X	5			X	5	X	5	X	5
DIV.	X	5	X	5	X	5	X	5	X	5	X	5	X	5
CTN.	X	5	X	5	X	5			X	5	X	5	X	5
INT.	X	5	X	5	X	5					X	5	X	5
REP.	X	5	X	5	X	5			X	5	X	5	X	5
UNI.	X	4	X	4	X	5			X	5	X	5	X	5
NAT.	X	5	X	5	X	5					X	5	X	5
W.Q.U.	X	5	X	5	X	5								
HAR.							X	3						
CONT.							X	5						
RAR.									X	5				
ANT.									X	5				
CDN.									X	5				
TOT.		39		38		40		13		40		35		35
AVE.		4.8		4.7		5.0		4.3		5.0		5.0		5.0
RTG.		E		E		0		E		0		0		0

CROSS-SECTIONAL DIAGRAM



FLORA: Early stages of moss/lichen encroachment on eskers. Numerous birch and few poplar. Bog vegetation.

FAUNA: Moose, wolf, fox, goose and caribou scats. Moose, wolf, fox, goose and bear tracks. Caribou antlers and fox's skull. Two Canada geese. One brood ducks. Scoters, yellow finch, whiskey jack and red squirrel. Porcupine chew marks.

GEOL./GEOM.: Two main beaches and one esker which branches into with extensive fields, bog veneer, kettle lake and large sand spit at narrows.

AESTHETICS: Good view of lake from esker top. Scenic campsite at foot of Shee-than-nee. Highly visible sand fields, scenic pond, old trapper's cabin and dog houses.

RECREATION: Excellent camping site and long esker walk through bush. Accessible trapper's cabin. Choice of several sheltered spots. Poor trout fishing and shallow waters.

HUMAN: Shee-than-nee where Hearne camped and trapper's cabin. Numerous flakes and arrowheads along beach. Evidence of Nash's dig. Tent rings.

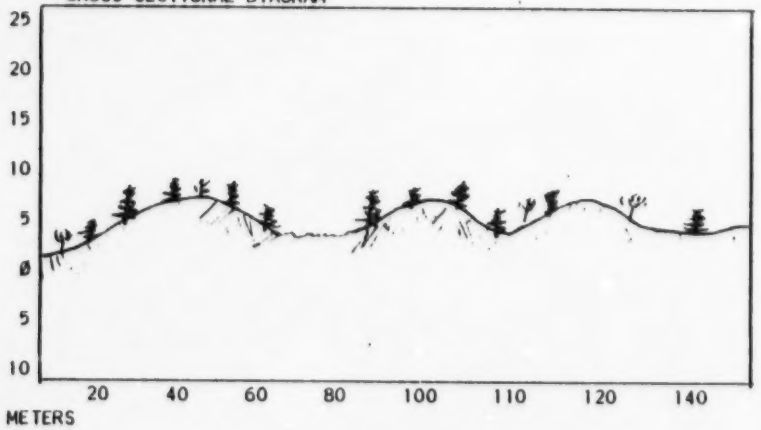
GENERAL COMMENTS: This is Shee-than-nee where Hearne camped for several days. It is a well treed esker which finishes at the narrowest spot on Shethanei Lake. Major stands of birch, white pine and some poplar found here. A fairly large kettle lake is found immediately behind the esker. Further back, the esker branches into three or four sand fields where different stages of moss growth are illustrated. Some unique plant formations as at Site 4 can be found. Caribou antlers, bones, tracks, etc. all make these sand fields quite impressive and well worth an afternoon hike. Behind the kettle lake, an old trapper's cabin and dog houses lie in a fallen state. On a nearby beach, hundreds of chips, arrowheads, etc. lie exposed. Nash's excavation pits illustrate the historical importance of this site.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
6		1 1	0 7	8 5	G D D F A C		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	3	X	2	X	5			X	1	X	1	X	1
DIV.	X	4	X	2	X	4	X	2	X	1	X	1	X	1
CTN.	X	3	X	2	X	4			X	1	X	1	X	1
INT.	X	3	X	2	X	2					X	1	X	1
REP.	X	3	X	2	X	3			X	1	X	2	X	2
UNI.	X	3	X	2	X	5			X	1	X	5	X	5
NAT.	X	5	X	5	X	5					X	5	X	5
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	3						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		29		22		33		7		8		16		16
AVE.		3.6		2.7		4.1		2.3		1.0		2.2		2.2
RTG.		G		G		E		F		P		F		F

CROSS-SECTIONAL DIAGRAM



FLORA: Wide variety of species and communities because of varying topography.

FUANA:

GEOL./GEOM.: Drumlin field oriented northeast.

AESTHETICS: Best appreciated when flying over.

RECREATION: Low potential.

HUMAN:

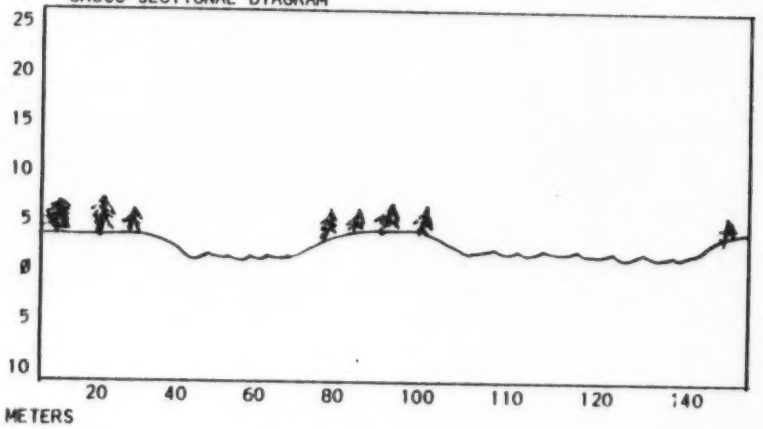
GENERAL COMMENTS: Drumlin field of geomorphological significance.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
7		11	07	85	GDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	3	X	4			X	1	X	4	X	4
DIV.	X	2	X	3	X	4	X	5	X	1	X	4	X	4
CTN.	X	2	X	2	X	4			X	1	X	4	X	4
INT.	X	2	X	2	X	4					X	4	X	4
REP.	X	3	X	2	X	4			X	1	X	4	X	4
UNI.	X	2	X	2	X	3			X	1	X	3	X	3
NAT.	X	5	X	5	X	5					X	4	X	4
W.Q.U.	X	5	X	5	X	5								
HAR.							X	4						
CONT.							X	3						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		23		24		33		12		8		27		27
AVE.		2.8		3.0		4.1		4.0		1.0		3.8		3.8
RTG.		F		G		E		E		P		G		G

CROSS-SECTIONAL DIAGRAM



FLORA: Typical spruce forest.

FUANA: High concentration of fish, possibly seals.

GEOL./GEOM.: Confluence of Wolverine and Seal Rivers.

AESTHETICS: Wide, open area and appealing rapids at inflow.

RECREATION: Excellent fishing. Side route up the Wolverine River.

HUMAN: Not surveyed.

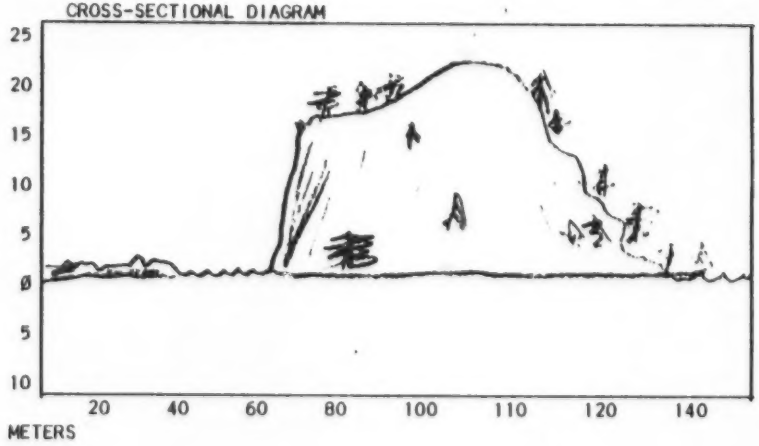
GENERAL COMMENTS: Good area for afternoon's angling with a potential to view wildlife.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
8		11	07	85	GDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	4.	X	4	X	5			X	4	X	5	X	
DIV.	X	4	X	3	X	4	X	5	X	2	X	5	X	
CTN.	X	4	X	3	X	4			X	3	X	5	X	
!NT.	X	4	X	3	X	4				3	X	5	X	
REP.	X	3	X	3	X	4			X	3	X	5	X	
UNI.	X	4	X	4	X	5			X	3	X	5	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	5						
RAR.									X	3				
ANT.									X	3				
CDN.									X	3				
TOT.		33		30		32		12		27		35		
AVE.		4.1		3.7		4		4		3		5		
RTG.		E		G		E		E		G		0		

CROSS-SECTIONAL DIAGRAM



FLORA: Juniperis horizontalis on crest. Polygonal moss formations in blowouts.

FAUNA: Seal sighted. Bear, moose, wolf sign.

GEOL./GEOM.: Huge esker, eroded scarp, major blowout fields.

AESTHETICS: Excellent view of river, islands, forest. Scarp. Rapids, bedrock outcrop.

RECREATION: Excellent fishing, class 3 rapids. Aesthetics excellent. Hiking.

HUMAN: 1 grave.

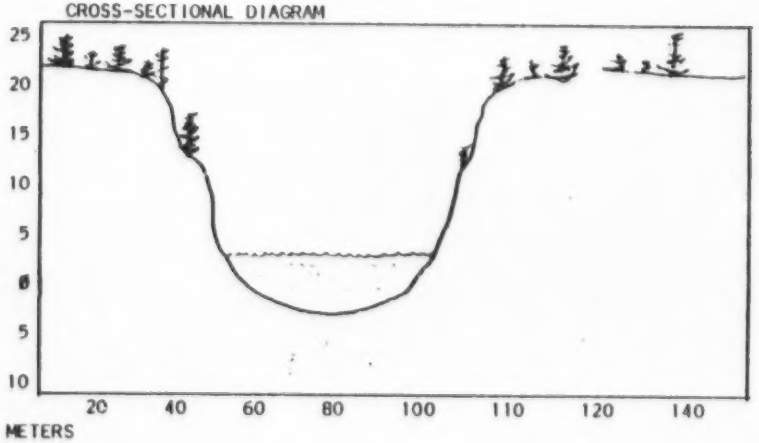
GENERAL COMMENTS: Huge esker, 15 meter sand scarp, bedrock outcrop into river which create fast but deep set of class 3 rapids. Hiking and view not to be missed. Poor camping, steep esker must be climbed.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
9		13	07	85	GDWADF		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	2	X	5			X	1	X	3	X	3
DIV.	X	2	X	2	X	2	X	4	X	1	X	3	X	3
CTN.	X	2	X	2	X	4			X	1	X	3	X	3
INT.	X	2	X	2	X	4					X	3	X	3
REP.	X	2	X	2	X	1			X	1	X	3	X	3
UNI.	X	2	X	2	X	5			X	1	X	3	X	3
NAT.	X	5	X	5	X	5					X	3	X	3
W.Q.U.	X	5	X	5	X	5								
HAR.							X	4						
CONi.							X	2						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		22		22		31		10		8		21		21
AVE.		2.7		2.7		3.8		3.3		1.0		3.0		3.0
RTG.		F		F		G		G		P		G		G

CROSS-SECTIONAL DIAGRAM



FLORA: No lowland species.

FUANA:

GEOL./GEOM.: Gorge carved during pre-glacial times.

AESTHETICS: Steep cliff walls and deep, smooth water.

RECREATION: Aesthetics.

HUMAN:

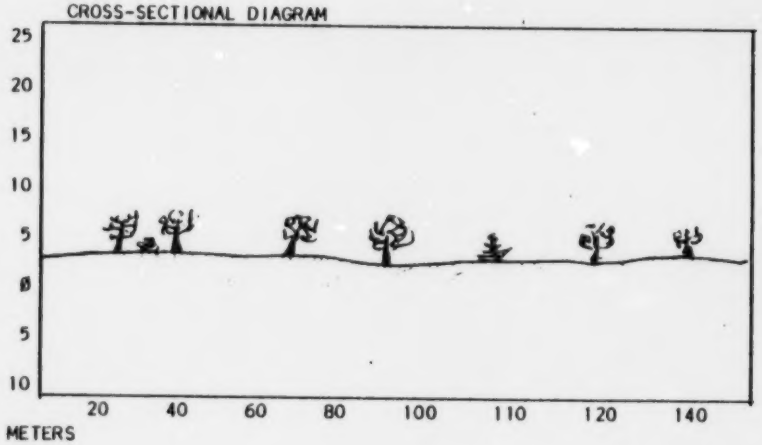
GENERAL COMMENTS: Kilometer-long straight gorge with high cliffs.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
10		14	07	85	GDACDF		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	3	X	3	X	4			X	1	X	3	X	3
DIV.	X	2	X	1	X	2	X	4	X	1	X	3	X	3
CTN.	X	2	X	1	X	4			X	1	X	3	X	3
INT.	X	2	X	2	X	3					X	3	X	3
REP.	X	2	X	2	X	4			X	1	X	3	X	3
UNI.	X	3	X	3	X	4			X	1	X	5	X	5
NAT.	X	5	X	5	X	5					X	5	X	5
W.Q.U.	X	5	X	5	X	5								
HAR.							X	4						
CONT.							X	3						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		24		22		31		11		8		25		25
AVE.		3.0		2.7		3.8		3.6		1.0		3.5		3.5
RTG.		G		F		G		G		P		G		G

CROSS-SECTIONAL DIAGRAM



FLORA: Nearly devoid. Lichens and jack pine.

FUANA: Small burrow holes.

GEOL./GEOM.: Large plateau, flat and sandy. Forty meter eroded scarp on south bank.

AESTHETICS: First open area for quite a distance. View of rapids and scarp.

RECREATION: Good camping site.

HUMAN: Recent campsite. Some refuse.

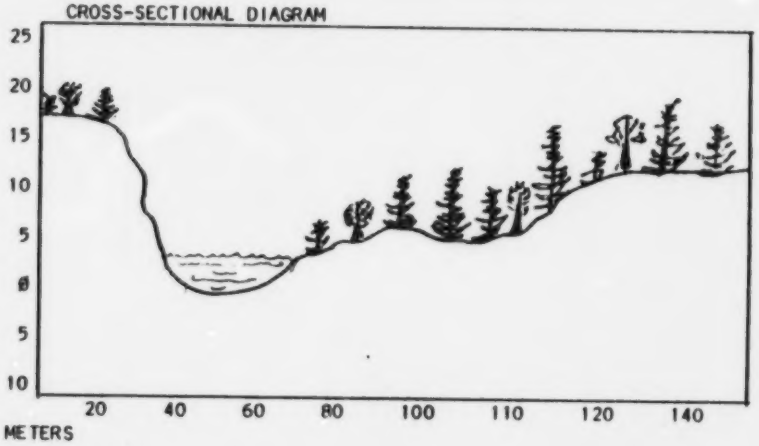
GENERAL COMMENTS:

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
11		18	07	85	GDDFWA		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	4	X	3	X	5			X	1	X	3	X	
DIV.	X	4	X	4	X	4	X	3	X	1	X	3	X	
CTN.	X	3	X	4	X	4			X	1	X	3	X	
INT.	X	3	X	4	X	4					X	4	X	
REP.	X	2	X	4	X	2			X	1	X	3	X	
UNI.	X	4	X	3	X	4			X	1	X	3	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	4	X	4	X	4								
HAR.							X	2						
CONT.							X	2						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		29		31		32		7		8		24		
AVE.		3.6		3.8		4.0		2.3		1.0		3.4		
RTG.		G		G		E		F		P		G		

CROSS-SECTIONAL DIAGRAM



FLORA: White spruce (20" diameter), jack pine, poplar and tamarack. Twenty to twenty-five meter high white spruce trees.

FAUNA: Bear, wolf, moose and fox tracks. Caribou bones. Songbird nest with four eggs. Hare.

GEOL./GEOM.: Eskers, meander scars and oxbows.

AESTHETICS: Low, burned over and poor vistas.

RECREATION: Long walk in.

HUMAN:

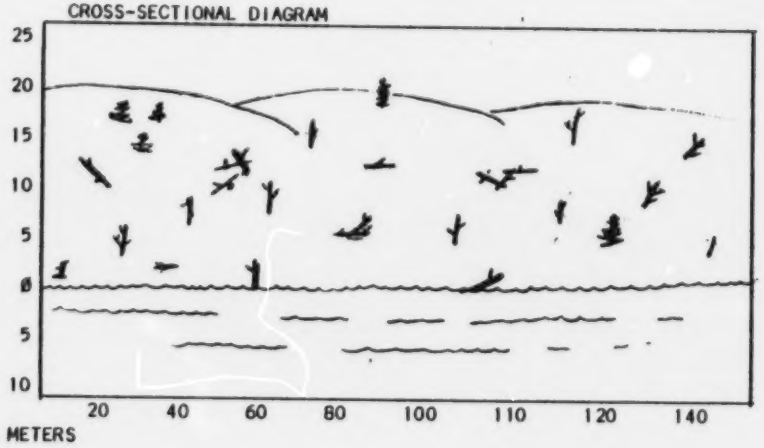
GENERAL COMMENTS: Out of the way area and quite a walk in. Once beyond the mouth, nice for canoeing up the river. Scenic view of esker. Very heavily burned area. Very large white spruce trees. An abundance of tracks on esker sand fields. Is a meander scarred (complex) delta with an esker on one side of the river and blow-outs on the other.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
12		18	07	85	GDDFWA		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	3	X	2	X	5			X	5	X	3	X	3
DIV.	X	4	X	2	X	5	X	2	X	4	X	3	X	3
CTN.	X	4	X	2	X	4			X	5	X	3	X	3
INT.	X	2	X	2	X	5					X	3	X	3
REP.	X	2	X	2	X	5			X	5	X	3	X	3
UNI.	X	2	X	5	X	5			X	5	X	1	X	1
NAT.	X	1	X	1	X	1					X	1	X	1
W.Q.U.	X	5	X	5	X	5								
HAR.							X	1						
CONT.							X	5						
RAR.									X	5				
ANT.									X	5				
CDN.									X	5				
TOT.		23		21		35		8		39		17		17
AVE.		2.8		2.6		4.3		2.6		4.8		2.4		2.4
RTG.		F		F		E		F		E		F		F

CROSS-SECTIONAL DIAGRAM



FLORA: Burned over, large stands, emergent vegetation.

FAUNA: Moose tracks.

GEOL./GEOM.: Esker, sand bar in river.

AESTHETICS: Beautiful area of river with sand bars, sand flats and emergent vegetation. Burned over.

RECREATION: Potential campsite. Good scenery.

HUMAN: Significant remains. Flakes, chips, scrapers and one perfect arrowhead.

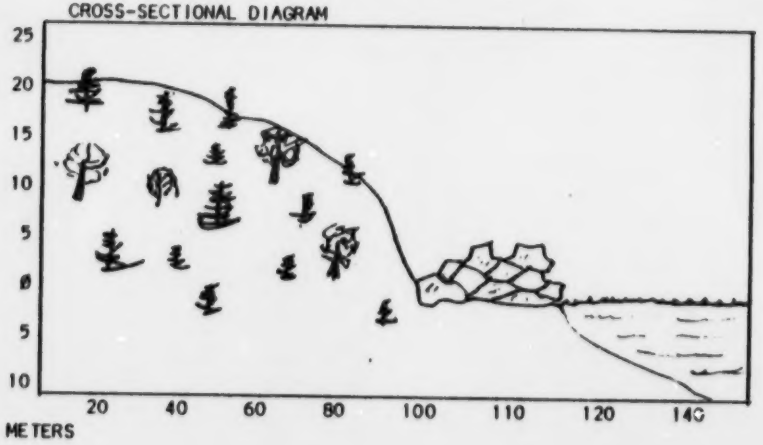
GENERAL COMMENTS: High concentration of prehistoric remains.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
13		18	07	85	DFWAGD		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	4	X	3	X	5			X	5	X	4	X	
DIV.	X	4	X	3	X	5	X	5	X	3	X	4	X	
CTN.	X	4	X	4	X	5			X	5	X	4	X	
INT.	X	4	X	4	X	5					X	4	X	
REP.	X	4	X	4	X	5			X	5	X	4	X	
UNI.	X	4	X	3	X	5			X	4	X	3	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	4						
CONT.							X	4						
RAR.									X	5				
ANT.									X	5				
CDN.									X	5				
TOT.		34		31		40		13		32		28		
AVE.		4.2		3.8		5.0		4.3		4.0		4.0		
RTG.		E		G		O		E		E		E		

CROSS-SECTIONAL DIAGRAM



FLORA: Birch stands on side of esker. Hummock lake and wet vegetation. White spruce.

FAUNA: Moose, bear, wolf, fox and yellow legs.

GEOL./GEOM.: Esker well rounded, double with kettle lake in middle. Area of exposed bedrock. Distinct cleavage plains, ledges and pothole drillings.

AESTHETICS: Excellent view of Great Island and lake. Rock patterns and shear plains. Impressive rapids.

RECREATION: Good hiking, aesthetics, photography, sketching and human heritage appreciation.

HUMAN: Scrapers, broken chert or flint, cutting stone, two fire pits (one recent, one old) and possible old camp. Quartz stone material.

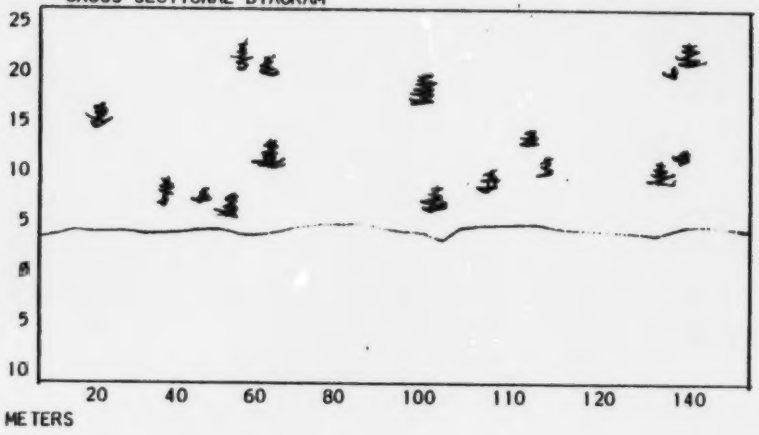
GENERAL COMMENTS: This is an esker located at the mouth of the Lavallee Channel, a short distance from several good campsites. Fairly interesting flora. Of note is the majestic view of Great Island from the esker and the abundance of artifacts. Easy and interesting walk. One kilometer down the channel, an area of exposed bedrock pinches off the river creating a powerful set of rapids. Interesting fractures here.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
14		18	07	85	GDWADF		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	3	X	3	X	5			X	1	X	5	X	
DIV.	X	3	X	3	X	4	X	5	X	1	X	5	X	
CTN.	X	3	X	3	X	4			X	1	X	5	X	
INT.	X	3	X	3	X	4					X	5	X	
REP.	X	5	X	3	X	4			X	1	X	5	X	
UNI.	X	2	X	3	X	5			X	1	X	5	X	
NAT.	X	3	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	5						
CONT.							X	1						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		25		28		32		11		8		35		
AVE.		3.1		3.5		4.0		3.6		1.0		5.0		
RTG.		G		G		E		G		I		O		

CROSS-SECTIONAL DIAGRAM



FLORA: Emergent vegetation.

FAUNA: Shorebirds, moose and bear.

GEOL./GEOM.: Esker plateau, base of Great Island structure.

AESTHETICS: Excellent view of expanse of river.

RECREATION: Excellent campsite, angling and photography.

HUMAN: Non-existent, probably removed.

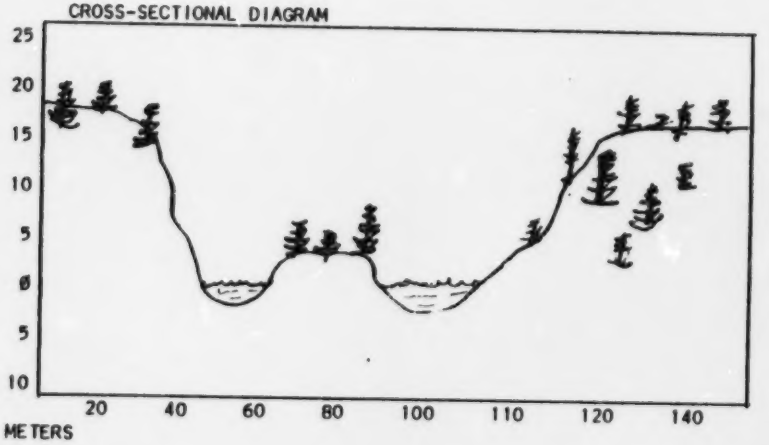
GENERAL COMMENTS: Esker plateau with beach. Good spot for camping.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
15		19	07	85	GDWADF		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	4	X	3	X	5			X	4	X	5	X	
DIV.	X	4	X	4	X	5	X	5	X	4	X	5	X	
CTN.	X	4	X	4	X	5			X	4	X	5	X	
INT.	X	4	X	4	X	5					X	5	X	
REP.	X	4	X	5	X	5			X	5	X	5	X	
UNI.	X	4	X	3	X	5			X	3	X	5	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	5						
CONT.							X	5						
RAR.									X	5				
ANT.									X	5				
CDN.									X	5				
TOT.		34		33		40		15		35		35		
AVE.		4.2		4.1		5.0		5.0		4.3		5.0		
RTG.		E		E		0		0		E		0		

CROSS-SECTIONAL DIAGRAM



FLORA: Jack pine stand, white birch and white spruce.

FAUNA: Wolf, moose, caribou and fox.

GEOL./GEOM.: Esker, blow-out, gorge and steep channel with bedrock, marine clays, complex fracturing, slate, stratified, anticlines, iron oxidation, alkaline deposits and needle fractures.

AESTHETICS: Superb view of esker/bedrock and island. Gorge views. Jack pine valley. Widening in river.

RECREATION: Photography, hiking, rock hounding and scenic viewing (stimulated the artistic).

HUMAN:

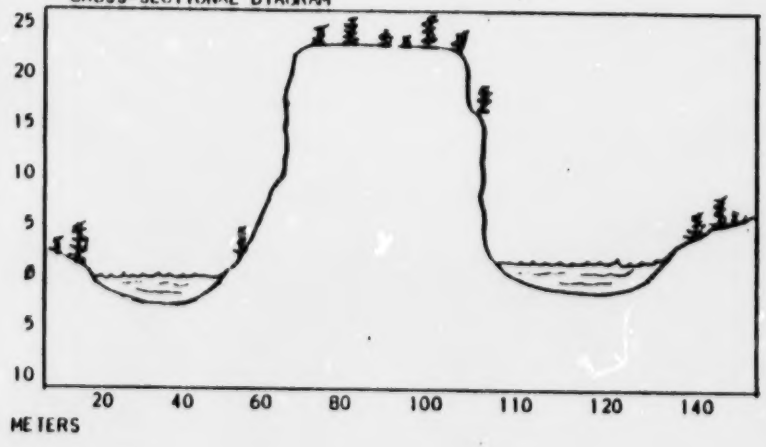
GENERAL COMMENTS: Esker on one site of the river, bedrock and clay exposed on the other. This is a diverse and beautiful area with superb aesthetics. Esker is long and well rounded with interesting jack pine stretch. Bedrock island in middle of river is particularly beautiful from top of esker. View of two sets of rapids. Ruggedness of gorge. Knife/needle like gorge/fracture system in bedrock with white baking powder like deposits. One of the most appealing sites yet.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
16		19	07	85	DFWAGD		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	3	X	3	X	5			X	1	X	5	X	
DIV.	X	2	X	3	X	5	X	5	X	1	X	5	X	
CIN.	X	3	X	3	X	5			X	1	X	5	X	
INT.	X	2	X	3	X	5					X	5	X	
REP.	X	3	X	3	X	5			X	1	X	5	X	
UNI.	X	3	X	5	X	5			X	1	X	5	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	4						
CONT.							X	5						
RAR.									X	1				
ANT.									X	1				
CUR.									X	1				
TOT.		26		30		40		14		8		35		
AVE.		3.2		3.7		5.0		4.6		1.0		5.0		
RTG.		G		G		O		E		P		O		

CROSS-SECTIONAL DIAGRAM



FLORA: White birch and fireweed.

FAUNA: Seal, cliff swallows and twenty clay nests.

GEOL./GEOM.: Bedrock promontory, shear cliffs, dark on side, red color, bedding planes dip at 60° to 70° and very old shield area.

AESTHETICS: View of cliffs, gorge, rushing water and rugged views. Multi-colored angular facets.

RECREATION: Photography, painting, sketching and scenic viewing. Poor camping capability.

HUMAN:

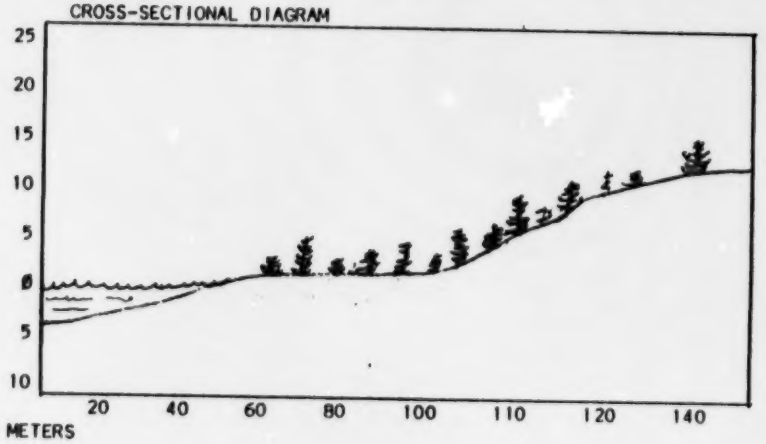
GENERAL COMMENTS: Breath-taking beauty, possibly of national significance. Rushing water and huge vertical sided rock. Photography and painting capability excellent.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
17		19	07	85	GDACDF		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	2	X	3			X	5	X	2	X	
DIV.	X	2	X	2	X	2	X	2	X	5	X	2	X	
CTN.	X	2	X	2	X	2			X	5	X	2	X	
INT.	X	2	X	2	X	2					X	2	X	
REP.	X	2	X	2	X	2			X	5	X	2	X	
UNI.	X	2	X	2	X	2			X	5	X	2	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	2						
RAR.									X	5				
ANT.									X	5				
CDN.									X	5				
TOT.		22		22		23		6		40		17		
AVE.		2.7		2.7		2.8		2.0		5.0		2.4		
RTG.		F		F		F		F		0		F		

CROSS-SECTIONAL DIAGRAM



FLORA: Typical.

FAUNA: Pair of Canada Geese.

GEOL./GEOM.: Base of esker.

AESTHETICS:

RECREATION: Limited.

HUMAN: Chips, flakes and fire rings.

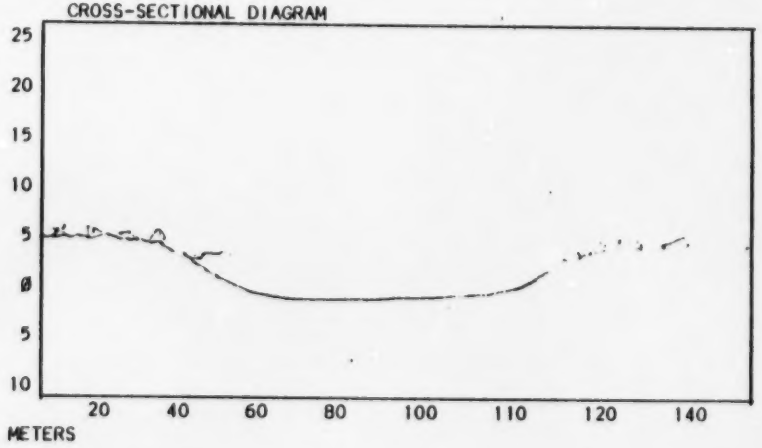
GENERAL COMMENTS: Moderate campsite. Abundance of human artifacts.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
18		20	07	85	GDWAAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	1	X	1	X	5			X	1	X	3	X	
DIV.	X	1	X	1	X	2	X	5	X	1	X	3	X	
CTN.	X	1	X	1	X	5			X	1	X	3	X	
INT.	X	1	X	1	X	5					X	3	X	
REP.	X	1	X	1	X	4			X	1	X	3	X	
UNI.	X	1	X	1	X	5			X	1	X	3	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	3						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		16		16		32		10		8		23		
AVE.		2.0		2.0		4.0		3.3		1.0		3.2		
RTG.		F		F		E		G		P		G		

CROSS-SECTIONAL DIAGRAM



FLORA: Typical.

FAUNA: Non.

GEOL./GEOM.: Three kilometer stretch of rapids.

AESTHETICS: Impressive view of rapids.

RECREATION: Class four rapids.

HUMAN: None.

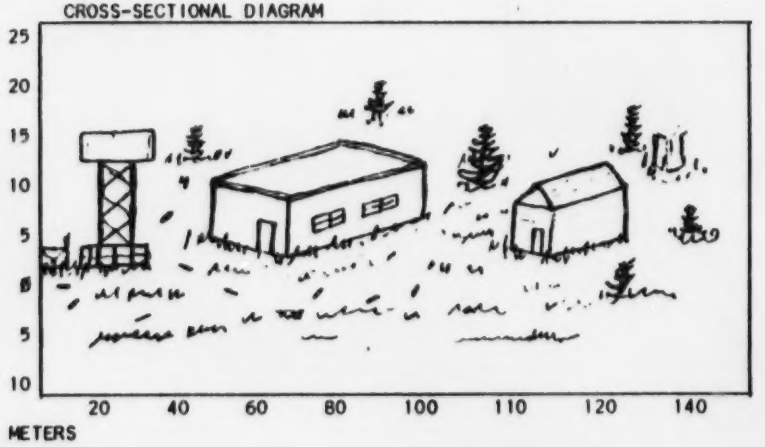
GENERAL COMMENTS: Nine bar Rapids. Numerous boulders, ledges and whitewater. Difficult portage. Burned over.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
19		21	07	85	DFWAGD		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	3	X	3			X	5	X	5	X	
DIV.	X	2	X	3	X	3	X	5	X	5	X	5	X	
CTN.	X	2	X	3	X				X	5	X	5	X	
INT.	X	2	X	3	X						X	5	X	
REP.	X	2	X	3	X	3			X	3	X	5	X	
UNI.	X	2	X	3	X				X	5	X	5	X	
NAT.	X	2	X	3	X						X	5	X	
W.Q.U.	X	4	X	4	X									
HAR.							X	5						
CONT.							X	5						
RAR.									X	4				
ANT.									X	3				
CDN.									X	4				
TOT.		18		25		9		15		34		35		
AVE.		2.2		3.1		3.0		5.0		4.2		5.0		
RTG.		F		G		G		O		E		O		

CROSS-SECTIONAL DIAGRAM



FLORA: Typical -- spruce.

FAUNA: Caribou antlers, bear bone and geese offshore.

GEOL./GEOM.: Cultural features of a prospector's camp, including core samples.

AESTHETICS: Numerous buildings in stages of repair (weathered log), toboggan and cabins.

RECREATION: History appreciation, photography and sketching.

HUMAN:

GENERAL COMMENTS: Two lived-in buildings, dynamite storage shack, outhouse, drilling platform (or possibly to store drilling equipment or core recording shed). Hundreds of cores around. Cabin starting to fall in (used in 1953 to 1958). An abundance of kettles, pans, cups and books. A bent board toboggan and 18' freighter canoe.

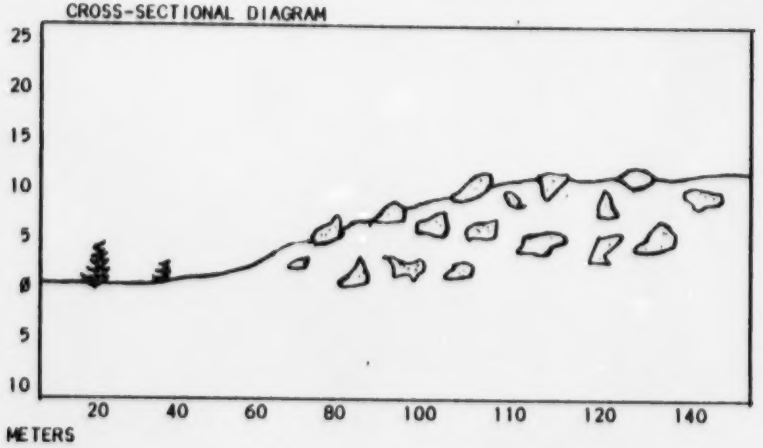
NOTE: Mining blasting cap disposal danger!

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
20		22	07	85	GDWADF		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	4	X	1	X	5			X	1	X	3	X	
DIV.	X	2	X	1	X	2	X	5	X	1	X	3	X	
CTN.	X	4	X	1	X	5			X	1	X	3	X	
INT.	X	4	X	1	X	4					X	3	X	
REP.	X	4	X	1	X	1			X	1	X	3	X	
UNI.	X	4	X	1	X	4			X	1	X	3	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	1						
CONT.							X	5						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		32		16		31		11		8		23		
AVE.		4.0		2.0		3.8		3.6		1.0		3.2		
RTG.		E		F		G		G		P		G		

CROSS-SECTIONAL DIAGRAM



FLORA: Lichens. One stunted spruce.

FAUNA: None.

GEOL./GEOM.: One kilometer long structure. Erratics.

AESTHETICS: Excellent view.

RECREATION: One hour hike to top and back.

HUMAN: None.

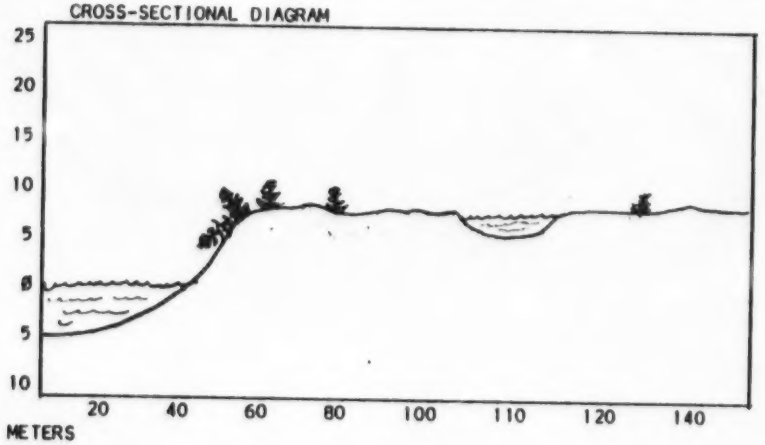
GENERAL COMMENTS: Large, lime green bedrock hill. Good views.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
21		23	07	85	GDACWA		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	5	X	5	X	2			X	1	X	2	X	
DIV.	X	4	X	3	X	2	X	4	X	1	X	2	X	
CTN.	X	4	X	3	X	2			X	1	X	2	X	
INT.	X	4	X	3	X	2					X	2	X	
REP.	X	5	X	3	X	2			X	1	X	2	X	
UNI.	X	3	X	2	X	2			X	1	X	2	X	
NAT.	X	5	X	5	X	5					X	2	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	4						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		35		29		22		10		8		14		
AVE.		4.3		3.6		2.7		3.3		1.0		2.0		
RTG.		E		G		F		G		P		F		

CROSS-SECTIONAL DIAGRAM



FLORA: First area of tundra heath environment.

FAUNA: Moose and wolf tracks.

GEOL./GEOM.: Sandy banks collapsing into river.

AESTHETICS: Open areas.

RECREATION: Limited.

HUMAN: None.

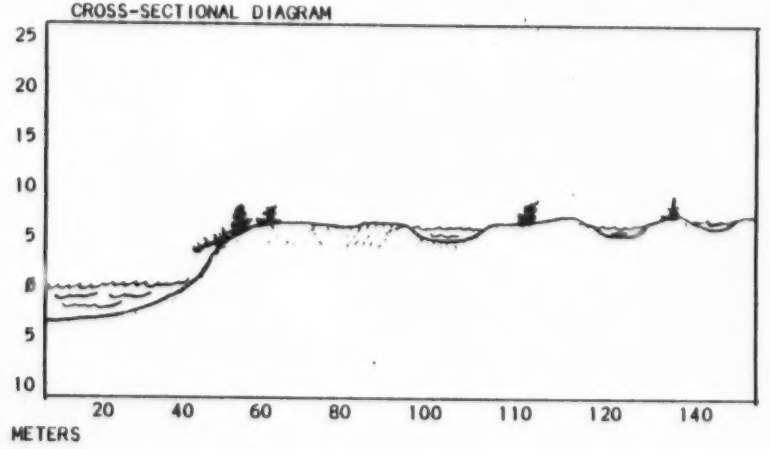
GENERAL COMMENTS: First area of tundra in forest due to climatic influence of Hudson Bay.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
22		24	07	85	GDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	3	X	3	X	3			X	1	X	2	X	
DIV.	X	3	X	3	X	3	X	3	X	1	X	2	X	
CTN.	X	3	X	3	X	3			X	1	X	2	X	
INT.	X	3	X	3	X	3					X	2	X	
REP.	X	3	X	3	X	3			X	1	X	2	X	
UNI.	X	3	X	3	X	3			X	1	X	2	X	
NAT.	X	5	X	5	X	2					X	5	X	
W.Q.U.	X	5	X	5	X	2								
HAR.							X	3						
CONT.							X	3						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		28		28		22		9		8		17		
AVE.		3.5		3.5		2.7		3.0		1.0		2.4		
RTG.		G		G		F		G		P		F		

CROSS-SECTIONAL DIAGRAM



FLORA: Tundra species, tamarack and heath environment. Peat polygons.

FAUNA: Moose and wolf.

GEOL./GEOM.: High, loamy and collapsing banks. Beaches.

AESTHETICS: Open expanses of land and river.

RECREATION: Excellent docking beaches.

HUMAN: None.

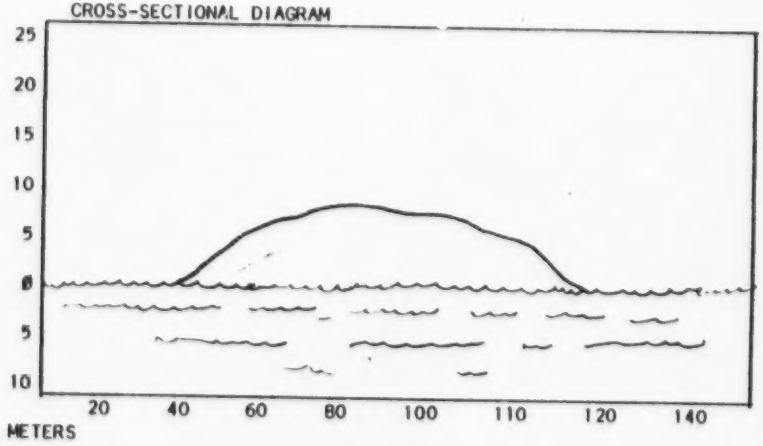
GENERAL COMMENTS: Numerous areas of treeless heaths.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
23		25	07	85	GDWADF		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	5	X	2	X	2			X	1	X	2	X	
DIV.	X	2	X	2	X	2	X	2	X	1	X	2	X	
CTN.	X	4	X	2	X	2			X	1	X	2	X	
INT.	X	4	X	2	X	2					X	2	X	
REP.	X	4	X	2	X	2			X	1	X	2	X	
UNI.	X	4	X	2	X	2			X	1	X	2	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	2								
STAR.							X	2						
CONT.							X	2						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		33		22		22		6		8		17		
AVE.		4.1		2.7		2.7		2.0		1.0		2.4		
RTG.		E		F		F		F		P		F		

CROSS-SECTIONAL DIAGRAM



FLORA: Raised peat plateau island. Erosion of peat layers.

FAUNA: Three seals.

GEOL./GEOM.: High, ice-scoured banks.

AESTHETICS: Limited.

RECREATION: Limited.

HUMAN: None.

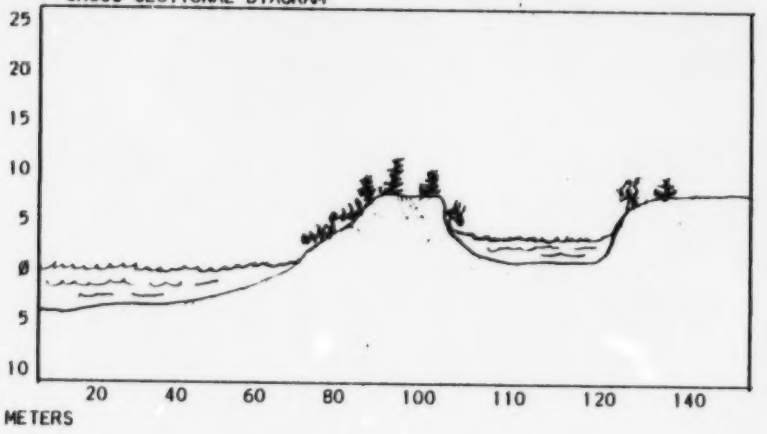
GENERAL COMMENTS: True peat polygons on island. Major blow-outs of peat on sides of island. Island is at the base of a gruelling set of shallow boulder rapids.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
24		26	07	85	GDDFWA		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	2	X	3			X	1	X	4	X	
DIV.	X	2	X	2	X	3	X	3	X	1	X	4	X	
CTN.	X	2	X	2	X	3			X	1	X	4	X	
INT.	X	2	X	2	X	3					X	4	X	
REP.	X	2	X	2	X	3			X	1	X	4	X	
UNI.	X	2	X	2	X	3			X	1	X	4	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	3						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		22		22		28		8		8		29		
AVE.		2.7		2.7		3.5		2.6		1.0		4.1		
RTG.		F		F		G		F		P		E		

CROSS-SECTIONAL DIAGRAM



FLORA: Forest/tundra.

FAUNA: Wolf and moose tracks. Canada Geese.

GEOL./GEOM.: High, collapsing banks, lagoon inland, thermo-karst lakes and beaches.

AESTHETICS: Good view of river.

RECREATION: Excellent, flat and sheltered campsites with beach. Hiking into backshore.

HUMAN: None.

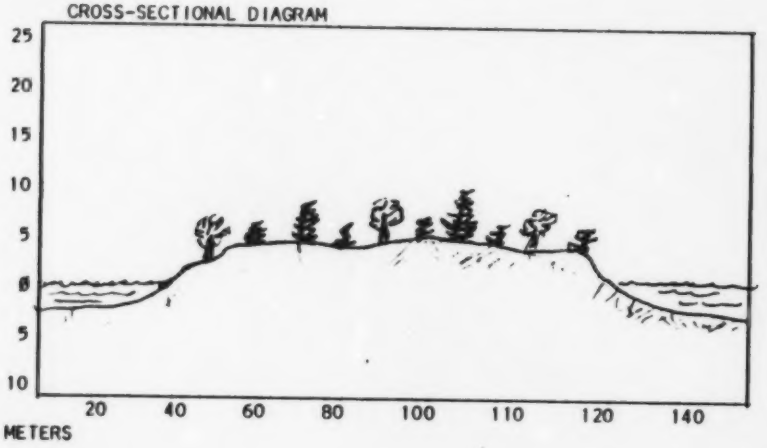
GENERAL COMMENTS: Excellent campsite, hiking potential into sandy backshore and lagoons. Long, desolate beaches and sand bars.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
25		26	07	85	GDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	4	X	2	X	4			X	1	X	4	X	
DIV.	X	4	X	2	X	4	X	4	X	1	X	4	X	
CTN.	X	4	X	2	X	4			X	1	X	4	X	
INT.	X	4	X	2	X	4					X	4	X	
REP.	X	2	X	2	X	2			X	1	X	4	X	
UNI.	X	4	X	2	X	4			X	1	X	4	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	4						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		32		22		32		10		8		29		
AVE.		4.0		2.7		4.0		3.3		1.0		4.1		
RTG.		E		F		E		G		P		E		

CROSS-SECTIONAL DIAGRAM



FLORA: White spruce, birch and interesting root systems.

FAUNA: Swan, and moose tracks.

GEOL./GEOM.: Alluvial deltaic deposits. Beach. Blow-outs.

AESTHETICS: Interesting blow-outs. Wide, open area of river.

RECREATION: Good campsite and hiking.

HUMAN: None.

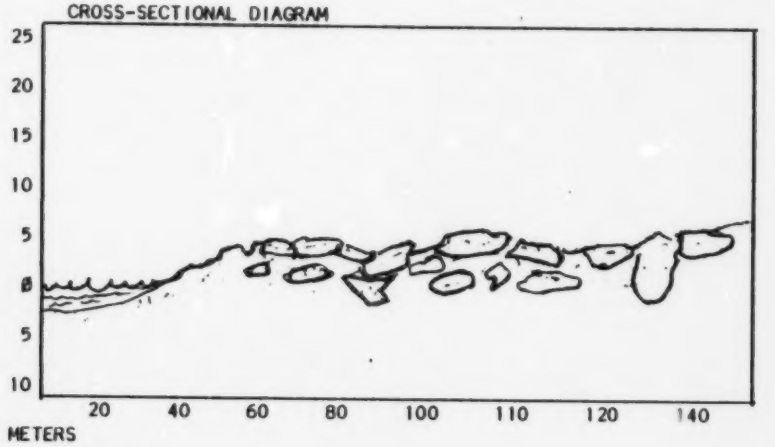
GENERAL COMMENTS: Sandy island with good campsite. Visible from a great distance. This would be a good spot for a two-day rest, as it is well sheltered, diverse, and campsites are few and far between from here to Hudson Bay.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
26		26	07	85	GDDFAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	2	X	5			X	1	X	2	X	
DIV.	X	2	X	2	X	2	X	3	X	1	X	2	X	
CTN.	X	2	X	2	X	4			X	1	X	2	X	
INT.	X	2	X	2	X	4					X	2	X	
REP.	X	2	X	2	X	3			X	1	X	2	X	
UNI.	X	2	X	2	X	5			X	1	X	2	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	1						
CONT.							X	5						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		22		22		33		9		8		17		
AVE.		2.7		2.7		4.1		3.0		1.0		2.4		
RTG.		F		F		E		G		P		F		

CROSS-SECTIONAL DIAGRAM



FLORA: Lichen -- small pioneer species.

FAUNA: None.

GEOL./GEOM.: Felsenmeer formation.

AESTHETICS: Rugged scenery -- very bleak.

RECREATION: Nature appreciation.

HUMAN: None.

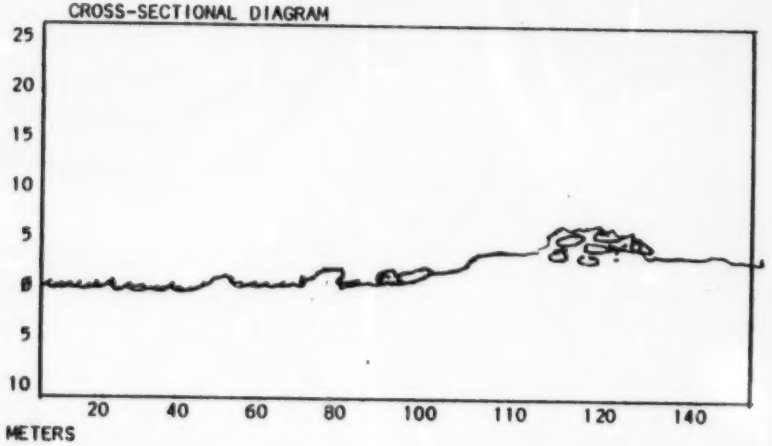
GENERAL COMMENTS: Large boulder field.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
27		26	07	85	GDDFWA		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	2	X	4			X	1	X	3	X	
DIV.	X	2	X	2	X	5	X	4	X	1	X	3	X	
CTN.	X	2	X	2	X	5			X	1	X	3	X	
INT.	X	2	X	2	X	5					X	3	X	
REP.	X	2	X	2	X	3			X	1	X	3	X	
UNI.	X	2	X	2	X	5			X	1	X	3	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	4						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		22		22		37		10		8		23		
AVE.		2.7		2.7		4.6		3.3		1.0		3.2		
RTG.		F		F		E		G		P		G		

CROSS-SECTIONAL DIAGRAM



FLORA: Typical.

FAUNA:

GEOL./GEOM.: Long boulder train, bedrock extending into river and sandy deposits in river bed.

AESTHETICS: Rugged, cove-like scenery.

RECREATION: Good aesthetics and grayling fishing.

HUMAN:

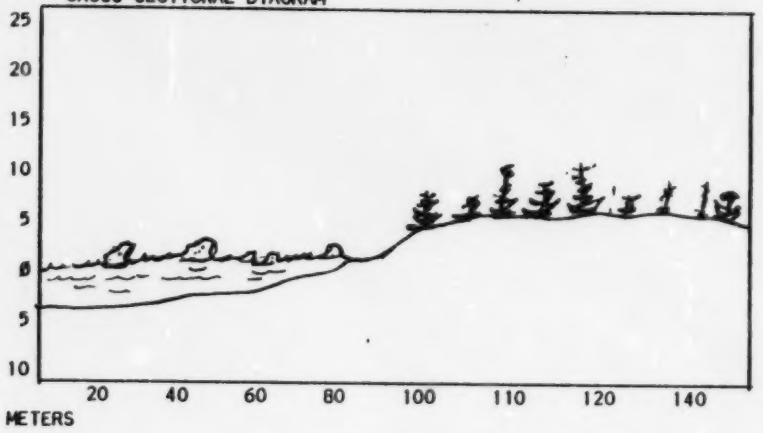
GENERAL COMMENTS: Cove-like bedrock exposure with several sets of small rapids and sandy/muddy deposits in shallow water. Linear pile of boulders.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
28		27	07	85	GDWAAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	4	X	4	X	3			X	1	X	2	X	
DIV.	X	4	X	4	X	3	X	2	X	1	X	2	X	
CTN.	X	4	X	4	X	3			X	1	X	2	X	
INT.	X	3	X	3	X	3					X	2	X	
REP.	X	3	X	3	X	3			X	1	X	2	X	
UNI.	X	4	X	4	X	3			X	1	X	2	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	2						
CONT.							X	2						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		32		32		28		6		8		17		
AVE.		4.0		4.0		3.5		2.0		1.0		2.4		
RTG.		E		E		G		F		P		F		

CROSS-SECTIONAL DIAGRAM



FLORA: Large tamarack trees and peat polygons. Trees may be over 300 years old.

FAUNA: Twelve caribou racks and one seal.

GEOL./GEOM.: Felsenmeer.

AESTHETICS: Rugged area of river.

RECREATION: Limited.

HUMAN:

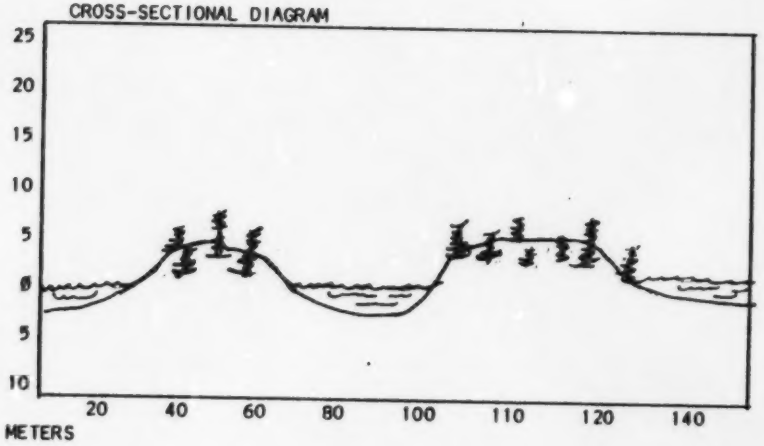
GENERAL COMMENTS: Rocky area of river with numerous islands. Few dry campsites. Peat polygons and tundra heaths prevalent.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
29		27	08	85	GDWADF		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	2	X	2	X	4			X	1	X	2	X	
DIV.	X	2	X	2	X	3	X	4	X	1	X	2	X	
CTN.	X	2	X	2	X	3			X	1	X	2	X	
INT.	X	2	X	2	X	4					X	2	X	
REP.	X	2	X	2	X	3			X	1	X	2	X	
UNI.	X	2	X	2	X	2			X	1	X	2	X	
NAT.	X	5	X	5	X	5					X	2	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	3						
CONT.							X	3						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		22		22		29		10		8		14		
AVE.		2.7		2.7		3.6		3.3		1.0		2.0		
RTG.		F		F		G		G		P		F		

CROSS-SECTIONAL DIAGRAM



FLORA: Typical mix.

FAUNA: Seals.

GEOL./GEOM.: Delta with numerous islands and rapids. Ice scour of banks uninterrupted.

AESTHETICS: High banks.

RECREATION: Limited. Few dry campsites.

HUMAN:

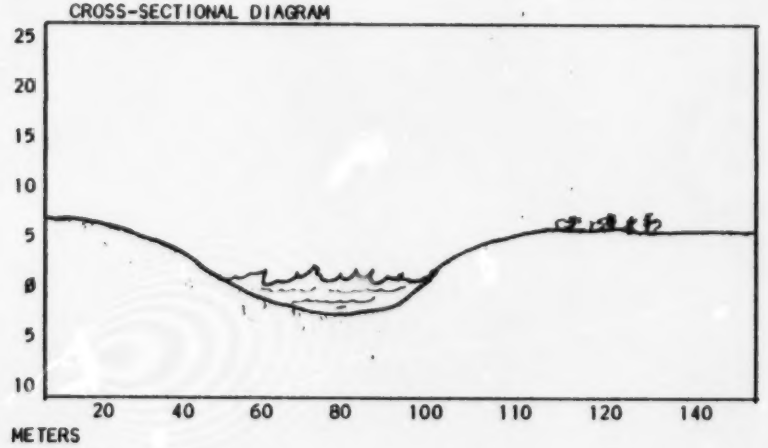
GENERAL COMMENTS: Navigation through maze of islands difficult. Several sets of rapids. This is the beginning of the delta, characterized by numerous islands and rapids. Entry into the estuary at high tide should start to be timed from this point to avoid a stay on the coast and polar bears.

CANADIAN HERITAGE RIVER SYSTEM - FIELD FORM

SITE NO.	MAP SHEET	DAY	MO.	YEAR	SURVEYORS	AERIAL PHOTO	ROLL SLIDES - SUBJECT
30		27	07	85	DFGDAC		

C.H.R.S.		FL.		FA.		G/G		AE.		HU.		CA.		AC.
SIG.	X	5	X	5	X	5			X	1	X	3	X	
DIV.	X	3	X	4	X	2	X	5	X	1	X	3	X	
CTN.	X	4	X	4	X	5			X	1	X	3	X	
INT.	X	4	X	4	X	4					X	3	X	
REP.	X	4	X	4	X	3			X	1	X	3	X	
UNI.	X	2	X	4	X	5			X	1	X	3	X	
NAT.	X	5	X	5	X	5					X	5	X	
W.Q.U.	X	5	X	5	X	5								
HAR.							X	1						
CONT.							X	5						
RAR.									X	1				
ANT.									X	1				
CDN.									X	1				
TOT.		32		35		34		11		8		23		
AVE.		4.0		4.3		4.2		3.6		1.0		3.2		
RTG.		E		E		E		G		P		G		

CROSS-SECTIONAL DIAGRAM



FLORA: First area of true and uninterrupted tundra species.

FAUNA: Sandhill crane (nesting pair).

GEOL./GEOM.: Major drops as river enters estuary.

AESTHETICS: Powerful and impressive chute of water. View of ocean and estuary.

RECREATION: Nature appreciation and aesthetics.

HUMAN: Remains of canoe. Scraps of wood.

GENERAL COMMENTS: Deaf or Silent Rapids. View of wide, open estuary and huge boulders is exhilarating. True arctic tundra.